AMERICAN SECTION

OF THE

International Association for Testing Materials.

PROCEEDINGS.

VOLUME I.

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AMERICAN SECTION

OF THE

INTERNATIONAL ASSOCIATION FOR TESTING MATERIALS.

BULLETIN No. 1. APRIL, 1899.

OFFICE OF SECRETARY OF AMERICAN SECTION,
TESTING LABORATORY, CITY HALL,
PHILADELPHIA, PA.

The Executive Committee has authorized the publication of the following abstracts of the minutes of meetings. Special attention is called to the announcement, given on page 7, of the Second Annual meeting, which is to be held in Pittsburg, Pa., on August 15 and 16, 1899.

A pamphlet containing statutes and by-laws, and lists of officers, committees and members, was issued on February 18, 1899. Additional copies, together with blank forms of application for membership may be obtained by addressing the Secretary,

RICHARD L. HUMPHREY,
Secretary.

ORGANIZATION MEETING, JUNE 16, 1898.

In response to a circular issued by Mr. Gus. C. Henning, American member of the Council of the International Association for Testing Materials, about twenty members assembled at the Engineers' Club in Philadelphia at 8 P. M., on June 16, 1898.

The meeting was called to order by Mr. Henning, who presented a letter from the International Council authorizing him to take measures to effect an organization of the American members. He also read a report of the International Council stating what had been accomplished since the Congress held at Stockholm in 1897.

After discussion the meeting resolved to form an American Section of the International Association, and organized by the election of the following officers;

Chairman, Prof. Mansfield Merriman.
Vice-Chairman, Prof. Henry M. Howe.
Secretary, Mr. Richard L. Humphrey.
Treasurer, Mr. Paul Kreuzpointner.

These officers, together with Mr. Gus. C. Henning, the American member of the International Council, were appointed an Executive Committee with full power to designate the American representatives for all the International Committees on technical problems.

Prof. Henry M. Howe and Dr. Richard G. G. Moldenke were elected members of the International Advisory Council.

The chairman was authorized to call a meeting in August for the purpose of completing the permanent organization by the adoption of by-laws, and the Executive Committee was requested to prepare a draft of by-laws for presentation at that meeting.

MEETING OF EXECUTIVE COMMITTEE, JUNE 25, 1898.

The first meeting of the Executive Committee was held at the Engineers' Club, Philadelphia, Pa., June 25, 1898, at 3.40 P. M. There were present Messrs. Merriman, Henning and Humphrey.

The Secretary presented a draft of the proposed by-laws, which were adopted after careful revision.

The Secretary was instructed to prepare and send to each member of the American Section a circular containing a brief history of the International Association, an abstract of the proceedings of the meetings of the American Section and its Executive Committee, a list of the members of the American Section, and a copy of the statutes of the International Association and the proposed by-laws of the American Section.

The letters which had been received from Messrs. Hanisch and Berger, Chairmen of International Committees Nos. 7 and 9, requesting the names of the American representatives on these Committees, were considered and Prof. Mansfield Merriman was appointed on Committee No. 7 and Dr. Charles F. McKenna and Mr. William W. Maclay on Committee No. 9.

Dr. Charles B. Dudley was appointed to act conjointly with Prof. Henry M. Howe as American representatives on the Sidero-Chemical Laboratory.

The meeting adjourned after passing a vote of thanks to the officers of the Engineers' Club for the use of their rooms.

MEETING OF EXECUTIVE COMMITTEE, JULY 30, 1898.

The Executive Committee met at the Engineers' Club, Philadelphia, July 30, 1898, at 3.20 P. M. Present Messrs. Merriman, Henning and Humphrey.

It was decided to hold the first annual meeting of the American Section at the Engineers' Club, Philadelphia, Pa., on August 27, 1898, and the following program was adopted:

Afternoon Session, 3 P. M.

1. Reading minutes of the meeting of June 16, 1898.
2. Adoption of by-laws.
3. Announcement of appointments.
4. Other business.

Recess.

5. Dinner at the Hotel Lafayette.

Evening Session, 8 P. M.

6. Unfinished business.
7. Discussion, "Relation of the International Association to Producers and Consumers," to be opened by Dr. Charles B. Dudley and Mr. William R. Webster.
8. Discussion, "In what Manner will the Adoption of Standard Specifications Improve Industrial Methods and Processes," to be opened by Mr. Gus. C. Henning and Prof. Rolla C. Carpenter.
9. Miscellaneous discussions.

The committee also adopted the following form of application for membership.

International Association for Testing Materials.
American Section.

The undersigned assumes membership in the International Association for Testing Materials, and agrees to be governed by its Statutes and By-Laws and to further its objects as laid down therein.

Dated.................. 189
Signature ....
Occupation ....
Official Title ....
P. O. Address.........................
Recommended by................
(two members) ....

The following appointments were made on the various International Committees:

Problem 1. A. S. Vogt, H. H. Campbell.

Problem 2. Booth, Garrett and Blair, Gus. C. Henning, Thomas Gray, Paul Kreuzpointner, A. A. Stevenson, William R. Webster.

Problem 3. George W. Bissell.

Problem 4. Monongahela Iron and Steel Co.

Problem 5. Max. H. Wickhorst.

Problem 6. Albert Sauveur.

Problem 8. Richard L. Humphrey, W. W. Maclay.

Problem 10. Booth, Garrett and Blair.

Problem 13. Richard L. Humphrey.

Problem 18. George S. Morison, H. B. Seaman, J. A. L. Waddell.

Problem 19. Robert H. Thurston.

Problem 20. John B. Johnson.

FIRST ANNUAL MEETING, AUGUST 27, 1898.

The first annual meeting of the American Section of the International Association for Testing Materials was held at the Engineers' Club, Philadelphia, Pa., August 27, 1898.

The afternoon session was called to order at 3.30 P. M., by the Chairman, Prof. Mansfield Merriman, with Richard L. Humphrey as Secretary.

Minutes of the meeting of June 16, 1898, were read and approved.

After a few minor changes the by-laws proposed by the Executive Committee were adopted.

The problems to be considered by International Committees were considered, the members making suggestions as to the proper American representatives.

Dr. Richard G. G. Moldenke thought the subject of Cast Iron should be considered by an International Committee.

The Chair requested Dr. Moldenke to present this subject for consideration at the evening session, embodying it in the shape of a resolution.

Inquiry by Prof. W. K. Hatt developed considerable discussion as to the present status of Impact Tests, and, on motion, the Chair was authorized to appoint a committee of three members of the American Section to report at the next annual meeting on the present state of knowledge of Impact Tests.

The meeting then took a recess. During the intermission the members dined at the Hotel Lafayette.

The evening session was called to order at 8.45 P. M.

Dr. Moldenke offered the following resolution:

Resolved, "That the Council of the International Association be requested to appoint a committee to investigate methods of testing cast iron." This resolution was unanimously adopted.

Mr. William R. Webster, in the unavoidable absence of Dr. Charles B. Dudley, opened the discussion on the subject, "The Relation of the International Association to Producers and Consumers," and was followed by Messrs. White, Moldenke, Kreuzpointner, Wille, Lesley, Whitney and Henning.

Mr. Henning opened the discussion of the subject "In what Manner will the Adoption of Standard Specifications Improve Industrial Methods and Processes." Messrs. Lesley, Humphrey, Davies, Kreuzpointner, Marburg and Hatt took part in the discussion which followed.

MEETING OF EXECUTIVE COMMITTEE, AUGUST 27, 1898.

A meeting of the Executive Committee was held August 27, 1898, at the Engineers' Club, Philadelphia, Pa. Present, Messrs. Merriman, Henning, Kreuzpointer and Humphrey.

The following appointments on special committees were made:

Problem 1. William R. Webster.
Problem 4. Bethlehem Iron Co.
Problem 19. Charles B. Dudley.
On the Present State of Knowledge of Impact Tests. William K. Hatt, Edgar Marburg.

MEETING OF EXECUTIVE COMMITTEE, JANUARY 18, 1899.

On January 18, 1899, at 3.35 P. M., Executive Committee met at the House of the American Society of Civil Engineers, 220 W. 57th St., New York. Present, Messrs. Merriman, Howe, Henning and Humphrey.

The Committee made the following additional appointments on International Committees:

Problem 4. H. V. Wille.
Problem 5. H. V. Wills.
Problem 7 a. James F. Kemp.
Problem 10. James M. Porter.
Problem 11. Andreas Lundteigen, Jasper Whiting.
Problem 12. Spencer B. Newberry, Clifford Richardson.
Problem 16. A. W. Dow, Lathbury & Spackman.
Problem 17. Frank A. Barbour.
Problem 18. Frank C. Osborn, A. H. Sabin.

On recommendation of the Secretary the following American Committees were created:

(2) "On the Application and Specifications of Basic Open Hearth Steel for Bridges, and Bessemer Steel for Rails."

(3) "On Proper Heat Treatment for all Grades of Iron and Steel, Especially in Rolling and Forging."

(4) "On the Relation Between the Chemical Composition and the Physical Properties of Iron and Steel, Especially in Connection with Finishing Temperatures."

The following were appointed on these committees, and were authorized to select other members from engineers, consumers and manufacturers, subject to the approval of the Chairman and Secretary of the American Section.

Committee (2) A. A. Stevenson, Carnegie Steel Company.
Committee (3) Henry M. Howe, Albert Sauveur.
Committee (4) H. H. Campbell, William R. Webster.

The Committee approved the action of the Secretary in issuing a pamphlet to contain the list of officers of the International Association, the list of officers and members of the American Section, the statutes and by-laws, a brief historical sketch, and a list of the American and International Committees.

The Committee decided that the dues of the American Section shall be payable on the first of January of each year.

It was also decided to hold the annual meeting at about the time of the Columbus meeting of the American Association for the Advancement of Science, and the Secretary was given full power to make the necessary arrangements for the program and all matters relating thereto.

MEETING OF EXECUTIVE COMMITTEE, FEBRUARY 22, 1899.

The Executive Committee met in Packer Hall,, Lehigh University, South Bethlehem, Pa., on February 22, 1899, at 2.30 P. M.

Present, Messrs. Merriman, Henning, Kreuzpointner and Humphrey.

The Committee decided that the American Committees shall hereafter be designated by the letters of the alphabet.

The Committee also confirmed the following additions to the membership of International and American Committees:

Committee No. 1. H. H. Campbell.
Committee No. 7 a. James F. Kemp.
Committee B. George F. Swain.
Committee D. James M. Porter.

The following resolutions governing the organization of the American members of International Committees were approved:

"Resolved, That the American representatives of each International Committee shall constitute a sub-committee of such International Committee, and that each sub-committee shall organize by the election of a chairman and secretary through whom all business connected with the sub-committee shall be transacted.

"It is further resolved, That each sub-committee is authorized to increase its membership when deemed necessary, such increase to be subject to the approval of the Executive Committee of the American Section."

It was also decided that these resolutions shall apply to the special American Committees.

The Secretary was instructed to send to each member of the American Section an abstract of the minutes of the meetings of the American Section and its Executive Committee.

The Committee decided to hold the next annual meeting at Pittsburg, Pa., on Tuesday and Wednesday, August 15 and 16, 1899, and to issue the program in the first week of July.

SECOND ANNUAL MEETING.

The second annual meeting of the American Section will be held at Pittsburg, Pa., on Tuesday and Wednesday, August 15 and 16, 1899.

Three sessions will be held and the program will include an address by the Chairman, reports of officers and committees, papers by members and topical discussions.

Opportunity will be afforded to visit testing laboratories and industrial establishments.

The complete program for this meeting will be issued about the first of July.

LIST OF MEMBERS.

CORRECTIONS.

PENNEVILLE, JAMES S. DE, Analytical Chemist,
University Club, 1510 Walnut Street, Philadelphia, Pa.

CARTER, OBERLIN M., Civil and Military Engineer,
Captain, Corps of Engineers, U. S. A., New York Athletic Club, New York, N. Y.

HOWE, HENRY M., Metallurgist,
Professor Metallurgy, Columbia University, 27 West Seventy-third Street, New York, N. Y.

NEALE, JAMES,
Secretary Wayne Iron Works, Pittsburg, Pa.

ADDITIONS.

Brown, William, Superintendent of Steel Plant and Engineer of Tests, Phœnix Iron Works, Phœnixville, Pa.	April, 1899
Broadhurst, W. H., Chemist, Department of Highways, Testing Laboratory, Municipal Building, Brooklyn, N. Y.	March, 1899
Burr, William H., Civil Engineer, Professor of Civil Engineering, Columbia University, New York, N. Y.	April, 1899
Cambria Iron Company, Charles S. Price, General Manager, Johnstown, Pa.	March, 1899
Carhart, P. E., Inspecting and Testing Engineer, Illinois Steel Company, Chicago, Ill.	March, 1899
Colby, J. Allen, Inspecting Engineer, Girard Building, Philadelphia, Pa.	April, 1899
Cruikshank, Barton, Director Clarson School of Technology, Potsdam, N. Y.	March, 1899
Deans, John Sterling, Bridge Engineer, Phœnix Bridge Company, Phœnixville, Pa.	March, 1899
Flagg, Stanley G., Jr., Stanley G. Flagg & Company, Nineteenth Street and Pennsylvania avenue, Philadelphia, Pa.	March, 1899
Goldsborough, W. E. Electrical Engineer, Professor Electrical Engineering, Director Electrical Laboratory, Purdue University, 618 South Street, Lafayette, Ind.	Feb., 1899
Gwilliam, George T., Civil Engineer, Manager McClave Brooks Company, Bourse Building, Philadelphia, Pa.	March, 1899
Robert W. Hunt and Company, Inspecting and Testing Engineers, 1121 The Rookery, Chicago, Ill.	April, 1899
Huston, Charles L., Vice-President Lukens Iron and Steel Company, Coatesville, Pa.	March, 1899
Jones and Laughlins, Ltd., Iron and Steel Manufacturers, Pittsburg, Pa.	April, 1899
Kennedy, Frank G., Jr., Superintendent Logan Iron and Steel Company, Burnham, Mifflin County, Pa.	March, 1899
Kennedy, Julian, Mechanical Engineer, Consulting Engineer Latrobe Company, Pittsburg, Pa.	Jan., 1899
King, Willis L., Manufacturer of Steel, Secretary, Jones & Laughlins, Ltd., Pittsburg, Pa.	March, 1899
The Colorado Fuel and Iron Company, Iron and Steel Manufacturers, J. A. Kebler, Second Vice-President and General Manager, Boston Building, Denver, Colorado	March, 1899
Wagner, Samuel Tobias, Civil Engineer, First Assistant Engineer, Pennsylvania Ave. Subway and Tunnel, City Hall, Philadelphia, Pa.	March, 1899

AMERICAN SECTION

OF THE

INTERNATIONAL ASSOCIATION FOR TESTING MATERIALS.

BULLETIN No. 2. JULY, 1899.

OFFICE OF SECRETARY OF AMERICAN SECTION,
TESTING LABORATORY, CITY HALL,
PHILADELPHIA, PA.

The second annual meeting will be held at Pittsburg, Pa., on Tuesday and Wednesday, August 15 and 16, 1899. The hotel headquarters will be at the Monongahela House, Smithfield and Water streets, where members can secure accommodations at the reduced rates, from $2.50 to $4.50 per day.

The sessions will be held in the rooms of the Engineers' Society of Western Pennsylvania, 410 Penn Avenue.

All persons interested in the objects of the Association are cordially invited to attend.

The following provisional program for the meeting has been authorized by the Executive Committee:

RICHARD L. HUMPHREY,
Secretary.

PROVISIONAL PROGRAM

FOR THE

SECOND ANNUAL MEETING

TO BE HELD IN PITTSBURG, PA.

AUGUST 15–16, 1899.

Hotel headquarters at the Monongahela House, Smithfield and Water streets.

Sessions at the rooms of the Engineers' Society of Western Pennsylvania, 410 Penn Avenue.

TUESDAY, AUGUST 15.

10.30 A. M.—Opening Session.

1. Reading minutes of first annual meeting.
2. Reports of officers of American Section.
3. Reports of officers of International Council.
4. Preliminary reports of Technical Committees.
5. New business.

2.00 P. M.—Inspection Visit.

6. Through the courtesy of the Carnegie Steel Co., Limited, a visit will be made to the furnaces, mills and laboratories of the Edgar Thomson Steel Works. Details will be announced in a later program.

6.30 P. M.—Dinner.

7. Informal dinner at the Monongahela House.

8.30 P. M.—Second Session.

8. Address by the Chairman.

9. Preliminary report of the American members of the International Committees on Standard Specifications and Methods of Testing Iron and Steel.

10. Discussion on Standard Specifications for Iron and Steel.

11. Miscellaneous business.

WEDNESDAY, AUGUST 16.

10.00 A. M.—Final Session.

12. Preliminary reports of the American members of the International Committees on Cement, Stone and Paints.

13. Preliminary report of the Committee on Impact Tests.

14. Comparison of Steel Plates in Flexure and Tension. Prof. William K. Hatt.

15. Discussion of reports.

16. Unfinished business.

2.30 P. M.—Inspection Visits.

17. Opportunity will be given for visiting the works of the Westinghouse Electric and Manufacturing Company and other industrial establishments.

LIST OF MEMBERS.

The list of members of the American Section issued on February 15, 1899, contained 104 names. The auxiliary list issued April 10, 1899, in Bulletin No. 1, contained 18 names. The following are the corrections and additions since April 10:

CORRECTIONS.

MOLDENKE, RICHARD G. G., Metallurgist,
McCandless and Stanton Aves., Pittsburg, Pa.

ADDITIONS.

COLBY, ALBERT LADD, Chemist and Metallurgist,
Metallurgical Engineer, The Bethlehem Steel Co., South Bethlehem, Pa.

DROWN, THOMAS M., Chemist,
President Lehigh University, Bethlehem, Pa.

LANZA, GAETANO, Mechanical Engineer,
Professor Theoretic and Applied Mechanics in charge Mechanical Engineering Department, Massachusetts Institute of Technology, Boston, Mass.

AMERICAN SECTION

OF THE

INTERNATIONAL ASSOCIATION FOR TESTING MATERIALS.

BULLETIN No. 3. AUGUST, 1899.

OFFICE OF SECRETARY OF AMERICAN SECTION,
TESTING LABORATORY, CITY HALL,
PHILADELPHIA, PA.

The second annual meeting will be held at Pittsburg, Pa., on Tuesday and Wednesday, August 15 and 16, 1899. The hotel headquarters will be at the Monongahela House, Smithfield and Water streets, where members can secure accommodations at the reduced rates, from $2.50 to $4.50 per day.

The sessions will be held in the rooms of the Engineers' Society of Western Pennsylvania, 410 Penn Avenue.

All persons interested in the objects of the Association are cordially invited to attend.

RICHARD L. HUMPHREY,
Secretary.

OFFICERS OF THE AMERICAN SECTION.

Chairman, PROF. MANSFIELD MERRIMAN,
Lehigh University, South Bethlehem, Pa.
Vice-Chairman, PROF. HENRY M. HOWE,
Columbia University, New York.
Secretary, RICHARD L. HUMPHREY, Philadelphia, Pa.
Treasurer, PAUL KREUZPOINTNER, Altoona, Pa.
International Councillor, GUS. C. HENNING, New York.
International Advisory Councillors, PROF. HENRY M. HOWE, New York, N. Y., and DR. RICHARD G. G. MOLDENKE, Pittsburg, Pa.

PROGRAM OF THE

SECOND ANNUAL MEETING

PITTSBURG, PA., AUGUST 15-16, 1899.

TUESDAY, AUGUST 15.

10.30 A. M.—Opening Session.

1. Reports of officers of the American Section.
2. Reports of officers of the International Council.
3. Discussion regarding the place for holding the Congress of the International Association in 1900.
4. New business.
5. Paper by Prof. W. K. Hatt: "Comparison of Steel Plates under Flexure and Tension."

2.00 P. M.—Inspection Visit.

6. Through the courtesy of the Carnegie Steel Co., Limited, a visit will be made to the furnaces, mills and laboratories of the Edgar Thompson Steel Works, located at Bessemer, about two miles from Pittsburg.

The works embrace 15 gross-ton converters, 4 spiegel cupolas using molten iron brought direct from the furnaces in ladles, 21 Siemens and two reverberatory heating furnaces, one three-high 40-inch blooming mill, two three-high rail trains, hot saws and finishing machinery, and also an iron and brass foundry forge. The chief products of these works are Bessemer steel rails and billets, and iron and brass castings. They have an annual capacity of 800,000 gross-tons of ingots, 650,000 tons of rails and billets, and 500,000 tons of castings. Natural gas is used as fuel.

6.30 P. M.—Dinner.

7. Informal Dinner at the Monongahela House.

8.30 P. M.—Second Session.

8. Address by the Chairman, Prof. Mansfield Merriman, on "The Work of the International Association for Testing Materials."

9. Preliminary report of the American members of the International Committee, No. 1, on Standard Specifications of Testing Iron and Steel; presented by Mr. William R. Webster, Chairman of the American Sub-Committee.

The report contains an account of the organization of the sub-committee and its division into sections, to each of which is assigned, the collection and study of a particular group of specifications. The progress thus far made is described with an outline of the plans of future work.

10. Miscellaneous business.

10.30 P. M.—Reception.

11. A reception is kindly tendered by the officers and members of the Engineers' Society of Western Pennsylvania to the officers, members and guests of the American Section of the International Association.

WEDNESDAY, AUGUST 16.

10.30 A. M.—Final Session.

12. Preliminary reports of the American members of the International Committees, Nos. 2-6, on Iron and Steel.

13. Preliminary reports of the American members of the International Committees, Nos. 7-19, on Cement, Stone and Paints.

14. Preliminary report of Committee A of the American Section on Impact Tests, presented by the Chairman, Prof. W. K. Hatt.

The report includes a digest of present information on the subject together with the answers to a circular sent by the committee to the officers of railroads, manufacturing plants and engineering colleges. These replies show that impact tests are practically limited to rails, axles, couplers, and car wheels, but they indicate an unexpected uniformity of practice.

15. Unfinished business.

2.00 P. M.—Inspection Visits.

16. Opportunity will be given for visiting the works of the Westinghouse Electric and Manufacturing Co., the Pittsburg Testing Laboratory and other industrial establishments.

The principal works of the Westinghouse Electric and Manufacturing Company are located on the main line of the Pennsylvania Railroad about 12 miles east of Pittsburg. All machinery is driven by two-phase electric motors, and the latest tools are used for effecting economy in time and cost of manufacturing. There are thoroughly equipped departments for electric testing and experimenting. All kinds of motors and generators for direct, alternating and polyphase currents are manufactured.

The Pittsburg Testing Laboratory, located at 325 Water Street, has facilities for making chemical and physical tests of all kinds of materials. It also carries on inspection of shop work, boilers, bridges and buildings.

INTERNATIONAL ASSOCIATION FOR TESTING MATERIALS.

AMERICAN SECTION.

BULLETIN No. 4. SEPTEMBER, 1899.

THE WORK OF THE INTERNATIONAL ASSOCIATION FOR TESTING MATERIALS.

AN ADDRESS BY PROFESSOR MANSFIELD MERRIMAN, CHAIRMAN OF
THE AMERICAN SECTION, AT THE SECOND ANNUAL
MEETING HELD IN PITTSBURG, PA.,
AUGUST 15 AND 16, 1899.

Prior to the year 1800 little was known of the properties of the materials of construction. Galileo had shown in 1638 that the strength of a rectangular beam varied with the square of its depth, Hooke in 1678 had announced the law that the stretch of a spring was proportional to the stress upon it, various authors had discussed the forms of beams of uniform strength, and Euler in 1744 had enunciated his formula for the resistance of columns under compression. Theory was far in advance of practice, for experiments had been so few and so imperfect that the elastic limit was scarcely recognized.

During the years from 1800 to 1850 great progress was made in the theory of elasticity, and a slow growth took place in knowledge of the properties of materials under stress. The introduction of railroads and the consequent necessity of providing a firm roadbed and safe bridge structures gave a powerful stimulus to the investigation of metals in order that ample security might be afforded with the greatest degree of economy. The methods of testing were, however, so imperfect that progress was slow, and, with the exception of the classic researches of Hodgskinson, the work of this period was mostly of value as a preparation for that of the future.

After 1850 large testing machines for special purposes began to be built, elongation and ductility began to be carefully studied, and soon after 1870 it was recognized by many manufacturers that physical tests of metals were imperatively necessary in order to secure uniformity of product. As these tests were multiplied and the records subjected to investigation, the knowledge was gained that the strength of a specimen depended upon its size and proportions and also upon the manner in which the load was applied. The term elastic limit assumed a new significance when it became recognized that it could be defined and measured in different ways. In short, it was found that tests of materials must be made in a similar manner in order to render the results comparable. This idea, although long recognized, has proved a difficult one to realize. It has been discussed by many engineering societies, some of which have attempted to formulate standard methods. Finally the International Association for Testing Materials was organized in order to study the whole subject and endeavor to arrive at conclusions that should be authoritative.

In 1882, through the influence of John Bauschinger, a number of German experimenters met at Munich and discussed the question as to how uniformity in the methods of testing materials could be promoted. As a result of this meeting formal conferences were held at Dresden in 1884, at Berlin in 1886, at Munich in 1888 and at Vienna in 1893, delegates from other European countries being often present. The reports of the proceedings of these conferences attracted wide attention, and the great value and importance of the discussions became universally recognized in engineering circles. In short, the movement assumed an international character.

In 1890, as a result of the international congresses of engineering held at Paris in the preceding year, the French government appointed a commission to formulate standard methods for testing the materials of construction. Its report, published in 1894 in four large volumes, is one of the most valuable contributions to the subject, but from the first it was recognized that ultimate conclusions could not be determined by a commission of one nationality, and accordinly, since 1895, the French government has given hearty support to the work of the International Association.

In 1895, as a result of the four preceding conferences, the fifth conference met at Zurich, all European countries, except Turkey, being represented. The United States government was represented by an army officer and the American Society of Mechanical Engineers by a delegate. At this congress the International Association for Testing Materials was formally organized, its object being, as stated in its statutes, "the development and unification of standard methods of testing for the determination of the properties of the materials of construction and of other materials, and also the perfection of apparatus for that purpose." This meeting at Zurich hence assumed an importance far greater than any preceding conference, and it may be called the first congress of the International Association.

At the Vienna convention of 1893 there had been appointed 20 committees on technical subjects, and reports from many of these were presented at the Zurich congress of 1895. These reports were published in the French and German languages in the official organ of the Association called "Baumaterialienkunde," the first number of which appeared in July, 1896. The work of some of these committees was continued, other subjects were proposed for future consideration, and a council was organized to transact the business of the International Association in the intervals between the congresses.

In 1897 the second congress of the International Association was held at Stockholm, there being present 361 members representing 18 countries. The United States government was represented by an army officer and a navy officer, and the American Society of Mechanical Engineers by a delegate. The congress continued in session for three days, reports of committees were presented, papers read and discussed, and plans outlined for the future work. It was resolved that the next congress should be held in Paris in the summer of 1900, and the council was authorized to appoint technical committees to make reports at that time on special problems relating to the objects of the Association.

At a meeting of the International Council held early in 1898 appointments were made of chairmen of 21 committees on technical problems, and the number of members on each committee from each country was assigned. It was also recommended, in order to expedite the appointment and work of these committees, that the members in each country should meet and form a national section of the International Association. In compliance with this recommendation a number of the American members met on June 15, 1898, and organized an American Section, whose first annual meeting was held at Philadelphia on August 27, 1898, and whose second annual meeting I now have the honor to address.

The membership of the International Association numbered 493 in 1895, 953 in 1896, 1,169 in 1897, 1,488 in 1898, and is now probably about 2,000. Germany takes the lead in regard to number of members, it having had 387 in 1898, while Russia had 315, Austria 158, England 83, Switzerland 83, United States 68, Sweden 68. France 66, Holland 48, Norway 42, Denmark 39, Spain 36, Italy 35 and 60 from nine other countries. With regard to the American membership, it may be noted that it numbered 6 in

1895, 25 in 1896, 60 in 1897, 68 in 1898 prior to the organization of the American Section, 106 in February, 1899, and that it is now nearly or quite 125.

There are two peculiarities regarding membership in this Association that deserve notice. First, there is no nomination or election of members, but any person desiring to be a member may do so on signing a statment that he assumes membership and will be governed by the laws of the Association; in so doing he further assumes the obligation, stated in Art. 5 of the statutes, that he will advance its interests to the best of his ability. Membership is hence a voluntary act assumed by an individual in order to promote the knowledge of the properties of materials and to endeavor to secure uniformity in methods of testing them. Withdrawal from membership may be made at any time by mere announcement to the proper officer of the Association.

The second noteworthy feature regarding membership is that it may be assumed by a corporation or society as well as by a person. For example, in the list of members of the American section, published in February last, will be found the Franklin Institute, the American Society of Mechanical Engineers, the American Foundrymen's Association, and five local engineering clubs, as also several steel companies, engineering journals, and firms engaged in inspecting and testing. In Europe this feature is carried much further, the membership of the German section including the bureau of public works of several cities, provinces and states, the police bureau of Berlin, the Prussian war department and the boards of direction of numerous railroads, as also a large number of manufacturing corporations and engineering societies. Under this arrangement it is possible for a corporation to exert a greater influence than through the indirect individual membership of its president or superintendent, both manufacturers and consumers can make their wishes more directly known, and thus differences in regard to methods of inspection and testing can be more quickly harmonized than under the usual plan of strict individual membership. However, fully three-fourths of the total members are individuals, and these include engineers in all branches, architects, chemists, professors of mechanics and engineering, and superintendents and foremen of works.

At the Zurich congress the dues of members were fixed at $1 per year, and while no change was made at the Stockholm congress, the council recommended early in 1898, in view of the heavy expenses, that each member should pay $1.50 per year. Accordingly, at the first annual meeting of this section, when our present by-laws were adopted, the provision was inserted that each member should pay $2.50 per year, of which $1.50 should be transmitted to the International Association and the remainder be used to defray the expenses of the American Section. This by-law went into effect on January 1, 1899, and accordingly no dues were collected by this section for the year 1898, the $1.50 payable for that year being forwarded to the International Council directly by each member or through the American member of that council. During the present year dues have been paid directly to our Secretary, and his report, together with that of our Treasurer, will be laid before this meeting.

The dues of $1.50 per year per member transmitted to the International Council are used by it in issuing its publications and in assisting its committees in defraying a part of the expenses of their special investigations. In addition to this income a number of societies and bureaus have agreed to make extra annual contributions, the Prussian war department heading the list with $125, and 21 others giving smaller sums, so that for the year 1898 the amount derived from these sources was about $400. Although official information is not at hand, it is safe to say that the total income of the International Association for the year 1898 did not exceed $2,000, which is certainly a small sum with which to issue its publications and carry on the work of 21 committees.

The International Association has issued yearly since 1895 a list of members, and also abstracts of the proceedings of the congresses of 1895 and 1897. These, together with a few circulars of information, constitute all the publications that it has been able to furnish free to its members. The detailed proceedings of the congresses have been printed in the journal "Baumaterialienkunde," published in the French and German languages, at Stuttgart, which has been furnished to members at $2.50 per year, the regular subscription price being $3.50. It will be seen, therefore, that an American member who desires to be fully informed regarding the work of the Association must necessarily subscribe to this journal, and by so doing his dues become really $5 per year. It should further be stated that arrangements will probably be made so that the official announcements of the International Council and the proceedings of future congresses will be printed in this journal in the English language, as well as in German and French.

The American Section, as already stated, had no income during 1898, and the report of our treasurer shows that during the present year the amount available for expenses has been about $120. On February 18 a pamphlet of 26 pages was issued, containing a list of officers of the International Association and its committees and a list of the American members, together with the statutes, bylaws and some historical information. In April a bulletin was issued, giving abstracts of the proceedings of the first annual meeting and of the meetings of the executive committee, and in

July a second bulletin was issued containing the preliminary programme for this meeting. It is hoped that the condition of our treasury may permit these bulletins to be continued, and that one may be issued containing the proceedings of this meeting.

The technical questions proposed for discussion at the Paris congress of 1900 are nineteen in number. The organization of the international committees which are to consider these topics is now complete, and preliminary reports from the American members of several of them are to be presented and discussed at this meeting. Probably the most important of these subjects is that of standard international specifications for testing and inspecting iron and steel; this committee originally consisted of about 40 members, of which five were assigned to this country, but under authority to increase its numbers the American sub-committee has been increased to 21, has held several meetings, collected specifications, and will present a preliminary report of much interest. It is also expected that the American members of five other international committees on iron and steel will report progress in their organization and work. As the national sub-committees are now in full correspondence with the international chairman, it is expected that the final reports which are to be presented for discussion at the Paris congress will prove of great interest and value.

Of the nineteen problems to be considered by the nineteen international committees, six are on iron and steel, one on stone and slate, eight on cements and mortars, one on tile pipe, one on paints, one on lubricants, and one on the dry rot of wood. The fact that there are eight committees on cements and mortars and only six on iron and steel may seem abnormal, but it should be remembered that in the testing of hydraulic cement the personal equation of the observer enters to a far greater degree than in the case of metals, and that its rapidly increasing use demands the immediate perfection of methods which will render comparable the work of different laboratories. It is expected that preliminary reports from some of our sub-committees on these questions will be presented at this meeting.

While the main object of the Association is to establish standard rules for testing, it is recognized that this cannot be done until a thorough knowledge is obtained of the properties of materials under varying conditions. Accordingly the work of some of the committees is to collect and digest the information now on record, or to make scientific investigations that will render present knowledge more complete and definite. Thus, there is a committee on the properties of steel at abnormally low temperatures, one on the relation of the chemical composition of stone to its weathering qualities, one to digest the work of previous conferences and conventions on the adhesion of hydraulic cement, one on the causes of the abnormal behavior of cements as to time of setting, and one on the protection of wood against the action of dry rot. Some of these subjects have already been discussed at the congresses of Zurich and Stockholm, and accordingly the reports to be presented to the Paris congress should contain positive additions to present knowledge.

At the annual meeting of this section, held last year, the desire was expressed to discuss the subject of impact tests, and a special committee was appointed, whose report will be presented at this meeting. Later, other members requested that other problems should be taken up by the section, and accordingly three other American committees have been organized on special problems connected with the manufacture of iron and steel. While these committees have no connection with the international ones, it is believed that their work will add to the interest of our annual meetings, and further the general objects of the Association.

There are advantages and disadvantages in doing technical work by committees. One advantage accrues through the harmonization of the different views held by individuals, whereby non-essentials are rejected and only fundamental methods retained. One of the disadvantages is that this process of harmonizing views takes time, causing reports to be long delayed, particularly with international committees. Some technical societies appoint committees with great reluctance, fearing that their reports may be regarded as official action. In the case of our international organization, no such fear is felt, and the report of a committee is to be considered from the same point of view as the paper of an individual member. Through the formation of the national sections, the work of the international committees can certainly be made more valuable and effective than ever before, for each national sub-committee, after having eliminated disagreements of its individual members, can work as a body to impress its views upon the other national sub-committees. In many cases an internatinoal agreement may be found difficult to make, but if made after such full discussion it will be sure to be authoritative and valuable.

The subject of the chemical analysis of iron and steel has been discussed in previous conferences and congresses, and at the Stockholm meeting in 1897 it was finally resolved to establish an international sidero-chemical laboratory at Zurich. It was stated that fifteen smelting companies and iron manufacturers had pledged themselves to contribute $3,500 per year for this purpose, and that the Polytechnicum at Zurich had offered the use of four well-equipped rooms. It was, accordingly, determined to open the laboratory in 1898, and an international commission was appointed to take charge of it and raise further funds for its maintenance. I am unable to state how fully this has been carried out, as no published accounts of its work have appeared. It is, however, to be doubted whether the establishment of chemical and physical laboratories falls properly within the scope of the objects of the Association. If sufficient funds could be raised so that men of different nationalities might meet at such a laboratory to actually make analyses and tests, each criticizing the others, while at the same time learning from them, then undoubtedly effective work would be done in harmonizing differences and perfecting standard methods. It is to be hoped if the establishment of the sidero-chemical laboratory at Zurich proves to be successful, that it may tend to further this method of research. It is, however, the opinion of many members that results as good, if not better, would be secured by arranging systematic schemes of investigation and distributing the actual work of analysis or testing among the laboratories of different countries.

A brief history of the organization and work of the International Association for Testing Materials, and that of its American Section, has now been given. The great interest taken in the movement in so many countries is an index of the necessity felt in all branches of the engineering profession for the introduction of uniform methods of testing and inspecting the materials of construction. This work is one that must occupy many years, and which in a certain sense can never be finished, for constant progress will be made in our knowledge of the properties of materials. In order to carry it on with success it is apparent that more money will be needed than the small amount now raised from the annual dues of members. In Europe the importance of the work of the Association is forcibly attested by the fact that engineering societies, bureaus of public works, iron and cement manufacturers, and railroads assist it by extra annual contributions, and it is to be hoped that the influence of this section may be sufficient to cause similar substantial gifts to flow into its treasury from American corporations. A proposition to establish a fund for research and publication will in fact be brought up for discussion at this meeting.

Since the above was written a circular of the International Council has been received containing the information that probably arrangements can not be made for holding the congress of the Association at Paris in 1900. It appears that the authorities of the Paris Exposition have the right to control the organization of all congresses held in that city in that year, and that they have announced one to be held on the subject of materials, and appointed officers to conduct the same. The subject will be discussed at this annual meeting, and expressions of opinion are desired as to whether it is best to abandon our congress of 1900, in order to cooperate with the one announced by the authorities of the Paris Exposition or to hold it at London during the week preceding.

In conclusion, it is with pleasure that I congratulate the American Section upon its activity and the Association itself upon the bright prospects before it. The undertaking inaugurated by Bauschinger and his associates bore good fruit at the conventions of 1884, 1886, 1888, and 1893, and prepared the way for the Zurich meeting of 1895, which was at the same time the fifth convention and the first congress. At the Stockholm congress of 1897 the true international work was begun, and the problems there proposed are now the subject of careful study in all parts of the earth. Let us hope that the reports to be presented at the future congresses will be such as to add to the present stock of knowledge, prove advantageous to both producers and consumers, and assist all engineers in economically using the materials and forces of nature for the benefit of man.

ANNOUNCEMENT

OF THE

PUBLICATION COMMITTEE.

At the Second Annual Meeting of the American Section, held on August 15 and 16, 1899, contributions amounting to $200 were made as the nucleus of a Fund for Publication and Research. Additional gifts have since been received, which have increased the Fund to $295. All persons desiring to contribute to this Fund are invited to address the Treasurer of the American Section, Paul Kreutzpointer, Altoona, Pa., and information regarding the work of the Association may also be obtained from the undersigned. A list of contributors to the Fund will be published in Bulletin No. 6.

MANSFIELD MERRIMAN,
Lehigh University, South Bethlehem, Pa.
RICHARD L. HUMPHREY,
City Hall, Philadelphia, Pa.
JAMES M. PORTER,
Lafayette College, Easton, Pa.
Publication Committee.

INTERNATIONAL
ASSOCIATION FOR TESTING MATERIALS.

AMERICAN SECTIONS.

BULLETIN NO. 5. OCTOBER, 1899.

PRELIMINARY REPORT ON THE PRESENT STATE OF KNOWLEDGE CONCERNING IMPACT TESTS.

Presented at the second Annual Meeting of the American Section, August 15 and 16, 1899, by Professors W. Kendrick Hatt and Edgar Marburg.

Prefatory Statement.

The members of this Committee regret that they have found themselves unable to complete, in time for this meeting, the program upon which they had agreed. Thus the proposed compilation of a descriptive bibliography relating to impact tests and impact machines, though fairly well advanced, is not sufficiently near completion, especially with respect to foreign publications, to warrant presentation at this time. Again, the account of impact machines constructed for purposes of scientific research is decidedly fragmentary. Concerning some of the later machines little or nothing has, in fact, been published. The current methods of what may be called commercial impact testing also deserve more extended and detailed notice than they have here received.

What follows is offered, therefore, merely as a preliminary report without pretensions to completeness. Besides some gener general matters relating to impact tests, the report contains a partial review of the more recent experimental researches on the mechanical properties of metals as revealed by impact, of the characteristic features of various machines, and a brief summary of opinions as to the value of impact tests in practice and the methods used or recommended. The latter information was elicited through inquiries addressed to various engineers, railroad officials, testing laboratories and manufacturing concerns.

It is to be stated also, that tests of a character approaching that of true impact tests, such as vibration tests (for stay bolts), rattler tests (for brick), and tests for hardness under falling weights were not considered as coming within the scope of the present inquiry. Cold bending and drifting tests, though somewhat of the nature of impact tests, were excluded for like reasons.

General Considerations.

The use of impact tests in a crude form has been resorted to from early times as a ready means of forming some judgment of the quality of material. This early use may be attributed to the following advantages: (1) The possibility of making such tests on larger manufactured pieces by means of simple, inexpensive appliances; (2) the ease and quickness with which results may be obtained; and (3) the apparently intimate relation between the action of the test and many of the common conditions of service.

The development of slow-testing machines, the operation of which was not only more easily controlled, but yielded far more definite results, led to a concentration of interest upon slow-testing methods and the innumerable problems connected therewith to the comparative neglect of impact testing. During that period which has witnessed the evolution of machinery for static tests to its present high state of perfection, investigations upon impact action have been relatively few, and, as a rule, inadequately planned. Nor has the subject engaged the long-continued attention of any single investigator. Moreover, the treatment of problems relating to resilience has been inadequately set forth in the text-books of mechanics, although this defect is now gradually disappearing.

A revival of interest is becoming apparent also in the experimental side of the subject, in its practical as well as in its scientific bearing. Thus, the action of the Pennsylvania Railroad and the Master Car Builders' Association in standardizing machines with spring foundation for the anvil for impact tests of axles and rails, may be instanced as a decided step towards the elimination of some of the chief sources of that irregularity in the results which has been the basis of much of the opposition to impact tests. The standard specifications for car-coupler tests, recently issued by the Master Car Builders' Association, also deserve notice in this connection.

In this country the use of impact tests is restricted mainly to rails, couplers, axles, and car-wheels, although small cast-iron bars are not infrequently subjected to such tests. In Germany and in France the impact test has found a wider range of application.

Thus, according to Professor Martens, shock tests for practical purposes have been made at the Charlottenburg Station upon gun-shot, stone, roof-covering materials, wire cables, cast-iron plates, in addition to the more strictly scientific investigations. These tests were made in compression, tension, bending, shearing and punching. In a review of the work of the Station for the year, 1897–98, appearing in the current volume of Baumaterialienkunde, it is stated that 43 shock tests were made out of a total of 2,315 of all kinds. These included 25 on cast iron, 10 on caulks for horseshoes, 6 on rivet iron, and 2 on axles.

Impact tests for axles, wheels, rails and tires are also common in Germany.

In France shock tests in tension as well as bending are applied to materials for guns, to forged steel, rails, rail-chairs, tires, and steel shells.

Apart from such commercial tests, an increasing activity in the scientific study of the mechanical properties of materials under impact action is quite noticeable. Professor Martens has given particular attention to compression under shock to which further reference will be made hereafter. The behavior of the metal in tension and in bending under impact has also received some study.

It is particularly gratifying to note that in America impact machines have been constructed, or are in process of construction at the laboratories of the U. S. Arsenal at Watertown, Mass., Lehigh University, Purdue University, the Virginia Polytechnic Institute, and McGill University. These machines are intended for scientific research which will have to be devoted primarily to obtaining the requisite fundamental data for placing impact testing on a more definite basis. Studies in tension and bending, and compression tests on steel, iron, cement, and stone are contemplated. Results derived from the pendulum machines of W. J. Keep and W. Bent Russell have already been published. The former has recently constructed a larger and improved form of his machine and is now engaged upon tests, the results of which are promised for early publication.

One of the most important questions connected with impact testing is: To what extent is the resilience under slow tension a measure of the resilience under shock? To answer this question, comparative tests under many varying conditions, as to material, dimensions and form of specimen, temperature, etc., will have to be made under such conditions that the work performed in deforming the specimen can be measured within reasonable limits of accuracy. Since this work is the product of force by deformation, any incidental deformation of the apparatus will be at the expense of the energy of the blow. The work of deforming the specimen is necessarily less, in all cases, than the total energy expended by the hammer. There is no great difficulty, however, in getting a closely approximate measure of the work performed upon the apparatus. The necessity of rigidity in the apparatus has been insisted upon in recent discussions, and this matter has doubtless received due consideration in the later machines.

The practical difficulties of impact tests in tension are sufficiently evident. In compression there is the advantage, that the entire volume of the metal is more uniformly deformed, whereas in tension the specimen does not deform uniformly as a whole, but has a partly elastic and partly plastic deformation irregularly distributed.

The influence of temperature on the results of rail, axle, and coupler tests demands more attention than it has yet received. As a rule these tests are made in the open air; so that, apart from the varying rigidity of the soil, largely compensated for by the insertion of springs under the anvil, there yet remains the increased brittleness of the material at low temperatures under shock as a disturbing element of a quite serious nature, Since such tests aim chiefly at comparative results, it is essential that they should be predicated upon conditions as nearly fixed as can be obtained by ordinary means.

When one pauses to consider the time and labor that have been expended in placing the methods of slow testing on a correct basis, one can better realize the magnitude of the task in prospect with regard to the much more complicated shock test. The principles and laws are not only more obscure, but the problems in machine design involved are far more difficult.

Impact Machines.

For flexure tests the ordinary commercial machine consists of a hammer falling, between rail guides, on the center of the rail or axle, which is supported on rounded cast-iron or steel abutments, the latter forming part of the anvil. In the most approved practice the anvil rests on a nest of calibrated springs of specified quality and size.

For tension tests several types of machines have been used. At the Charlottenburg Station the specimen is hung to an iron trestle (the anvil) and to the lower end of the specimen (held in wedges) is attached a frame, movable between vertical guides. The hammer strikes this frame, and the shock is communicated to the specimen. Evidently only comparative results under fixed conditions can be obtained. Another machine of the same type is used in this laboratory for testing wire cables. The hammer, guided by a gas pipe surrounding the cable, and falling on a weight at the lower end of the specimen is, by proper machinery, allowed to deform the cable 13 times per minute.

In another type of machine for longitudinal shock in tension, used in France, the specimen is arranged with an upper head, while the hammer, properly guided, is hung to a head or bushing on the lower end of the specimen. The specimen and hammer are lifted together by an attachment to the upper head, and then released. In the descent the upper head catches on a bridge between the uprights of the machine and impact results. This type of machine was used by Colonel Maitland in 1887, and by Mr. Comstock in testing wire cables at Cornell University in 1895. If a pencil be attached to the hammer and allowed to write a velocity-elongation curve on a revolving drum, this type of machine is susceptible of scientific use. In this form it has been used for the past two years at Purdue University in tests of steel and iron wire.

Modern machines of the pendulum type, for impact tests in bending, are represented by the well-known apparatus of W. S. Keep; and that of W. Bent Russell. In the machine designed by the latter great rigidity of foundation for the anvil was provided. The pendulum consists of a steel plate, so hung that the blow is delivered at the center of percussion of the plate, and provision is made for ascertaining the velocity of the pendulum before and after impact.

Professor Martens refers to a machine of the ballistic pendulum type designed by Professor Kick for scientific purposes. Both hammer and anvil are suspended by wires with adjusting screws so as to bring the center lines of the cylindrical hammer and anvil to coincidence. The specimen (for compression) is fixed to the anvil. The hammer is raised by a string to the desired height along the vertical arc of its movement. For release, the string is burnt. That part of the energy of the blow expended on the anvil is measured by the rise of the latter along the vertical arc of its motion.

A machine of this type has lately been completed at Lehigh University for testing cement briquettes under impact in flexure.

"The machine at the United States Arsenal, at Watertown, is of the vertical type. It has an anvil block, to which the anvil is secured, weighing 30,000 pounds; and this is supported upon a base also weighing about 30,000 pounds. Side rods carry a cross head and hydraulic cylinder, by means of which the hammer is raised. A hydraulic grip on the end of the piston rod of the cylinder directly engages a stem on the hammer, raising and releasing the latter at the desired height of fall. Hammers of different weights will be used up to 1 ton; and heights of fall giving striking velocities up to 20 feet per second.

"In general, it is intended to investigate the effect of rapidly applied stresses on different metals, observing phenomena within the elastic limit of the material in one class of tests and the phenomena which accompany stresses which cause permanent deformations in another class. Attention will center on the actual resistance encountered in both elastic and permanent deformations, comparing in this respect the results under slowly applied loads with those obtained at different rates of speed. This involves a determination of the resistance of the metal at each instant throughout the deformation, which it is intended to accomplish." The results developed will appear in the Annual Report of Tests of Metals and Other Materials.

Dr. R. Moldenke proposes, as a useful type of machine for cast iron, a pendulum machine in which the pendulum is to strike transversely the free end of a test-bar, which is clamped firmly at one end.

William Kent has designed a machine for longitudinal shock in which a number of specimens may be tested at the same time. A weight raised by a cam falls on a head attached to the lower end of each specimen.

In all impact machines, matters which should receive particular attention are: Friction, which should not be greater than two per cent.; coincidence of center lines of hammer and anvil; parallelism of faces of hammer and anvil; inertia of anvil; shape and material of striking edge of hammer when the latter is curved; guided length of hammer, and method of release. The suggestion has been made that some form of electro-magnet would be the best solution of the problem of release.

German specifications provide that machines shall be officially tested.

At the conference held in Vienna in 1893 for the unification of methods of testing, W. Schmitz presented a detailed and illustrated description of two impact machines, then in course of construction, which he had designed in conformity with the requirements prescribed in 1888 by the *Verein deutscher Eisenbahn-Verwaltungen*, for the testing of car-axles and wheels.

REVIEW OF EXPERIMENTAL DATA.

The state of knowledge up to 1894 has been so well reviewed by Professor Merriman in an address before the Section of Mechanical Science and Engineering of the American Association

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[1] Extract from letter written to the Committee by Col. J.W. Reilly, Commanding Officer, Watertown Arsenal.

for the Advancement of Science, delivered in August, 1894, that it seems necessary only to consider in some detail experiments undertaken since that time.

It may be said in general that the main problems for experiment are those in which the deformation exceeds that at the elastic limit. The conclusions from a purely mathematical treatment, usually confined to elastic deformation, are amply confirmed by tests made within the elastic limit; and confirmed also by tests up to rupture on materials whose elastic limit approaches the breaking strength. While it is highly important that theoretical considerations should be kept in mind in arranging and interpreting experiments, yet the solution of the main problems relating to impact must depend chiefly upon experiment, concerned as they are with total resilience. There is, for example, strong evidence pointing to the fact that certain materials, and other materials under certain conditions, vary greatly in their resilience according to the rapidity of application of the energy to the specimen. In the investigation of the influence of this and numerous other elements lies the work of experimentation, the end of which should be the framing of adequate specifications for tests.

The early experiments of Tredgold, Hodgkinson, Willis and Galton are well known. The laws of impact for cast-iron beams were determined, and the proportionality of resilence to volume and the effect of the inertia of the beams noted. The later experiments of Kirkaldy, Uchatius, Maitland and Estrada, on ductile materials have resulted in increased knowledge, although the data are too meagre for formulation; or even for the reconciliation of apparent contradictions.

As the speed at which the ordinary testing machine is run is increased, the ultimate strength and elastic limit seem slightly to increase, and the elongation to decrease; although, for tests of from about one to six minutes' duration no differences can be measured which are greater than the ordinary differences in quality of bars cut from the same plate. However, no extension of the facts gained from observations upon the effects of differences of speed of the ordinary testing machines can be applied to cases of impact.

The following is a brief and incomplete review of the more recent experiments:

Tension Tests.

Kirkaldy, 1862, found that wrought iron specimens broke under loads suddenly applied without impact with 82 per cent. of the load under slow tests. Uchatius, 1874, noted the increased total energy required to break a bar under a number of light blows compared with that required when broken with a single blow. Maitland, 1887, showed that in the case of unhardened gun steel the ultimate elongation was increased by impact. The specimens were 2 inches between shoulders; and broke in slow testing at 58,000 pounds per square inch with 27 per cent. elongation. The elongation under shock was 47 per cent., when shock was produced by a falling weight. Specimens were also screwed into plugs fitting in a strong tube and broken by exploding gunpowder and guncotton between the plugs. The ultimate elongation was then 47 to 62 per cent. The increased elongation is probably explained by the more uniform distribution of the elongation over the entire length of the specimen instead of its localization at a single neck. Estrada, 1893, made tests in longitudinal impact on nickel steel, armor plate, bridge steel and iron merchant bar, in test pieces of the same size as in slow tension tests. Tests were made at varying temperatures under the blow of a 100-pound hammer falling through heights varying from one-half to 25 feet. Accompanying tests were made in slow tension. A large amount of the energy of the hammer was absorbed in the apparatus. Rupture was brought about by a number of blows. The ultimate elongation under shock with a number of blows was about two-thirds greater than in the case of slow tension. The contraction of area remained about the same.

Recently, experiments in longitudinal impact were made in Austria by Captains Kuczera and Reinisch, on metals for gun carriages. The rods were of a three-sixteenth inch diameter and were subjected to light blows at temperatures of 68° and —4° F. Contrary to other experiences, these rods withstood a greater number of blows and developed greater extension at the lower temperature. Rupture of transverse nicked bars on the contrary was produced with fewer blows at the lower temperature.

In the *Report of the French Commission*, Le Chatelier has two reports which furnish data upon impact. The first, on the influence of duration of test; and the second on the effects of temperature. The main part of the first report deals with tests too slow for impact action. He notes the property which certain materials possess of adjusting themselves to a load, so that the elongation increase to a limiting value at the end of long periods; and the further property whereby the load at rupture increases with tests of shorter time. The latter is especially marked in the case of zinc which ruptured for a 60-minute test under less than one-half the load-producing rupture in one minute. Steel, iron, copper and aluminum did not exhibit this characteristic in any marked degree. In the case of copper, the effect of high temperatures, (200°, 350° and 440° C. were used) is to augment the influence of high speed in producing higher values of both ultimate load and ultimate elongation. The effect of the rate of application of the load upon the elongation is variable. Opposite results were found for materials of different degrees of hardness and for stresses of different degrees of intensity. Tests by Barba, Privat, and Le Chatelier, on wires broken with speeds varying between 11 minutes and 4 seconds, showed that for metals of small contraction of area, both the per cent. of elongation, and ultimate load increases with increase of speed; and that for metals of large contraction of area like soft steel, the elongation decreases as the speed increases, down to a duration of one minute, but that for tests quicker than one minute the elongation increases again.

Referring to impact proper, it was noted that, in the case of copper, a given reaction is not accompanied by as great an elongation under shock as under a steady load. The tests of M. Considère on soft iron wire are quoted to show that when the ultimate elongation is the same under slow test and shock a given elongation results in a much greater reaction in the case of shock.[1] The latter observer measured the reaction accompanying a given elongation from a falling weight by hanging the test wires to a spring.

In the second report on the influence of temperature, Le Chatelier, in addition to investigating the effect of temperature on the results of slow tests, obtained the effect of temperature on quick tests, and discusses fragility at low temperatures. From 100° to 250° C. quick tests gave a less ultimate load and a greater per cent. of elongation than slow tests at the same temperature. Above 300° C. the reverse occurred. While lack of shock-resisting capacity at the lower temperatures depended on the texture of the metal, it seemed that the texture played no part in brittleness at temperatures above 60° or 80° C., at which temperature the fracture of all grades of iron and steel was fibrous when at ordinary temperatures the fracture was coarse.[2] The contraction of hard and soft steel approached equality as the temperature was raised. The temperature of greatest brittleness depended on the speed of test. That is, while in slow tests the resilience was least at 300° to 350° C., the resilience under shock was least at about 500° C.

With slow tests, low temperatures give increased elongation,[3] but shock tests show less elongation at low than at normal temperature. The experimental evidence of decreased shock resistance at low temperatures is large. Thus, Sandberg, 1867, in the case of iron rails, found a diminution of shock resistance at 12° C. to one-third to one-fourth part of that at 28° C., the deformation being one-fourth part of that at 28° C.

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[1] Prof. J. B. Johnson, in his "Materials of Construction," has plotted these results of M. Considère in the shape of a stress-strain diagram and shown that the area of the latter for soft iron wire is about 30 per cent. greater under shock than under a steady load

[2] This difference of fracture was also noted by Andrews on wrought-iron car axles under impact.

[3] *i. e.*, in tests of Le Chatelier and others at the Berlin Testing Laboratory, and Cornell University.

M. Bernadou, for both soft steel and hard steel in flexure, observed a greatly decreased resilience under shock at —60° compared with +15° C., the decrease being less for hardened steel. These results were confirmed by Le Chatelier. At 100° C. the elongation increased. A nicked steel bar which broke without deflection at 15° C. gave a silky fracture at 100° and then only broke after pronounced bending.

Under shock, then, either a low temperature or a high temperature will develop a minimum resilience. A temperature of maximum resilience exists between these two, which is higher than the normal atmospheric temperature.

Le Chatelier remarks, it is evident that the resilience under slow tension is not a true measure of the shock-resisting capacity of materials at different temperatures; since in the case of slow tension the per cent. of elongation increases as the temperature is lowered, whereas in shock the reverse is true. At very low temperatures under shock there seems to be elongation only at the point of rupture.

Le Chatelier further notes that at ordinary temperatures, as the speed of the machine increases the ultimate load increases, but the yield points are raised more rapidly. Thus, as the speed increases the stress-strain curve becomes flatter and the elongation is confined to the weaker parts of the bar. The tendency of a bar broken quickly to form knobs is also referred to. Le Chatelier observed also the effect of low temperatures at a given test speed, in elevating the elastic limit toward the ultimate strength; and remarks that any cause, whether low temperature or quick speed or phosphorus which increases the ratio of the elastic limit to the ultimate strength will tend to produce brittleness. Tests with tempered wire showed that the resilience was much less affected by speed than in the case of annealed wire.

A series of tests in longitudinal shock, with accompanying tests in slow tension, has been made at Purdue University during the past two years on iron and steel wires from one-eighth to one-third inch in diameter, ranging in length from 4 to 9 feet. Results from 62 specimens have been obtained. The experiments will be continued next year on an improved machine, and with material more homogeneous than that used heretofore. The machine is of a type previously noted, the hammer being hung on the specimen and impact taking place at the upper head. The hammer varied from 845 to 1,230 pounds, the range of motion being from one-fourth to 7 feet. The specimens were ordinarily broken with one blow, so that the conditions were met of (1) a heavy hammer of low velocity; (2) large inertia of everything except the specimen; and (3) the use of a single blow. The anvil on which impact occurred at the upper head consists of two oak pieces 4×4 inches in section, bridging 20 inches clear span between uprights of machine, supporting a cast-iron block 14 inches by 18 inches by 6 inches thick, which in turn supported a steel block 4×4 inches in section and 14 inches long.

Some of the energy was absorbed at the anvil or bridge, but as the maximum reaction developed in the wire was 6,000 pounds and the deflection at the bridge did not exceed one-sixteenth inch, whereas the elongation of the specimen was usually 12 to 18 inches, the proportion of work absorbed was small. Thus, with 14 inches elongation of specimen it would be less than 1 per cent.

A pencil attached to the hammer describes a curve on the surface of a revolving drum, whose speed is determined by the record of a tuning fork. The total elongation of the specimen is thus recorded on the drum, as well as the velocity of the descending weight before and after impact. The total work done on the specimen and at the bridge is equal to the loss of kinetic energy of the hammer plus the weight of the hammer into the elongation of the specimen, the friction on the guides, and the work done in compressing the wedges being neglected. By drawing successive tangents to the velocity-displacement curve recorded on the drum, and determining the acceleration at successive points, a load elongation diagram, or stress-strain curve is obtained.

The specimen is held by conical wedges, fitting into a proper hole in cylindrical steel bushings.

In the tests referred to, the wedges were driven tightly and no slipping of the specimen in the wedges could be detected. A summary of the observations shows that the ultimate elongation, contraction of area and resilience were not different for Norway iron and medium steel wire about one-third inch in diameter under slow loading and impact. A greater elongation and contraction of area occurred under shock in the case of hard steel wire, and in the case of softer wire of one-eighth inch in diameter. The effect of temperature on elongation and resilience of Norway iron was marked.

One specimen broke in two places, and in other cases more than one neck developed in the specimen. In impact on wires of smaller diameter the elongation in the different foot-lengths varied apparently without any regularity, while in the case of slow-tension tests on the same material the elongation decreased regularly on each side of the fracture. In the case of thick wires the elongation was as uniformly distributed in slow as in rapid tests. Tests of Norway iron at low temperature developed knobs in the specimen, the elongation being confined to the length between knobs. These knobs were not noticeable at 210° F. The erratic behavior of some specimens indicated clearly that the material was not homogeneous. Detailed results will be published when the investigation is sufficiently advanced.

Tension tests under impact have been carried out by Professor Martens, but have proved so far of little promise. Tension tests were made on round bars 0.8 inch in diameter, of soft steel and bronzes. The deformation became less as the energy of the blow became greater. In general, the appearance of the surface of rupture was found alike in all respects under impact and slow stress. By rupture with several blows, the elongation was frequently greater than under slow tension.

Compression Tests.

The investigation of impact tests of metal in compression has been extended by Professor Martens and he has proposed specifications for their conduct. The form of test piece suggested is a cylinder of a diameter equal to the length, or a cube of equal volume. Rupture or a shortening of 0.8 is to be produced at a single blow, after a series of trials. Within the limits of size of hammer and height of fall used in the ordinary machines, the influence of speed of delivery of a given amount of energy does not seem important. After the blow, the specimen is drawn out by an attached cord to prevent the second blow, due to the recoil of the hammer. To insure uniform conditions of friction between the specimen and the hammer and anvil, it is recommended that these surfaces shall be treated with graphite. Greater deformation results from lubricated surfaces. The phenomena of rupture were found to be essentially the same in impact as in slow testing. It was noted that for a given specimen and hammer, a single heavy blow of a given energy will produce a greater deformation than a number of light blows of the same total energy.

A very precise measurement of the reaction and accompanying deformation under impact in compression was made by Lieutenant Dunn. The deformation of the copper test piece was indicated by the rotation of a small mirror, and the consequent travel of a beam of light along the surface of a rapidly rotating cylinder covered with a photographic film. From this velocity-displacement curve, the load-elongation curve was obtained which showed somewhat higher reactions for a given deformation than in the case of a load gradually applied.

Flexure Tests.

The tests of W. Bent Russell on cast iron confirm former conclusions with regard to proportionality of resilience to volume. His results on ductile metals are effected by the notching (to one-fourth depth) of the test bars. This, of course, had the effect of confining the deformation largely to the notch. No satisfactory comparisons can be made between shock tests on such bars, and slow tests on unnotched bars of the same depth.

Thos. Andrews' test on axles bear out other observations as to the appearance of the fracture; *i. e.*, wrought iron axles having a crystalline fracture at —18° F. showed a fibrous fracture at 300° F. The axles were subjected to flexure in opposite directions under the impact of a hammer. The number of flexions for rupture was a minimum at 570° F. Even a change of temperature from 32° F. to 212° F. diminished the number of flexions from 17 to 10. Other tests by Andrews at 0° and 100° F. showed that the total number of blows to fracture was increased, on the average, from 23.8 at 0° F. to 37.1 at 100° F. In this case the 4½ inch axles were subjected to the impact of a hammer of 2,240 pounds falling 30 inches on a span of 3½ feet. The temperature was restored, and the axle turned over after each blow. The average deflection per blow was the same at either temperature.

Professor Merriman found that the impact of a wooden ball on roofing slate furnished a good comparative measure of quality.

M. Hallopean showed that the loss of ductility in punching iron and steel plates, and the benefits of subsequent annealing, are best revealed by impact tests.

Professor Tetmajer's tests in bending or solid and built beams of mild steel and wrought iron showed the great superiority of the former metal under shock.

Professor Talbot subjected wooden and steel beams to impact action and verified the theoretical formulas for deflection.

Conclusions.

From the foregoing it appears that in general the elongation at rupture produced by a number of blows is larger than that in the case of a slow tension test, but that the elongation at rupture under a single blow is at times the same or less than in slow tension and at other times much greater. The reason for these variations are not yet determined. The variations are doubtless affected by the size of the specimens as well as the character of the material. The amount of the variation seems to be quite different in specimens of the same shape and apparently of the same quality. More extended investigations are needed before definite conclusions can be drawn. However, it is not to be expected that impact tests should give as uniform results as loads gradually applied.

The decreased resilience of material under impact at low temperature, is fairly well determined. An increased reaction under shock for a given deformation is to be expected and is confirmed by experiment. On account of the more general sharing of the whole bar in the elongation, and, at times, the formation of more than one neck, the elongation should be greater in impact, although this tendency in certain cases may be counteracted by the influences which bring about the observed knobby condition of the bar after rupture. It should be remembered that the total resilience is a function of the maximum elongation; namely, that just before breaking, and that the elongation after breaking is not always a true measure of this maximum elongation. At any rate the fact is well known that certain materials, as for instance, pitch or sealing wax, which exhibit a fair degree of strength and ductility under loading gradually applied can not endure even very slight deformation from shock without rupture. This is true, also, although the contrast is less marked, of rails high in phosphorus.

The opinion is widespread in practice that many defects of mechanical treatment can only be brought to light under the action of impact.

It is generally assumed that the ability of a metal to resist shock without rupture is expressed by the elongation at breaking combined with the ultimate stress, the elongation being the more important factor. However, in the case of material for armor plate, it is well known that a hard face is necessary to withstand the projectile. Here the valuable property of the material is that which enables it to quickly transfer the blow throughout a large body of metal. And this ability of metal to absorb shock by its prompt transmission throughout the mass must be kept in mind, as well as the shock resistance due to ductility.

In this connection it may be again remarked that a test involving rupture under a number of blows is not comparable to a test using one blow of the same total energy. Each successive blow must first overcome the elastic recovery from the preceding blow before it can increase the permanent deformation. Again, in compression, the effect of the first blow, or first few blows, is also to harden the metal. This hardening may result in a decreased resistance to the second blow. In some cases there may be a beneficial effect from a number of small blows.

AMERICAN COMMERCIAL TESTS.

Axle Tests.

The practice in this country is quite uniform. The usual conditions are: Weight of hammer, 1,640 pounds; anvil, 17,500 pounds on 12 springs; supports curved to 5-inch radius; span, 3 feet. The foundation is usually natural ground. The Pennsylvania Railroad specifications are generally followed quite closely. Steel axles 4¾ inches in diameter at center must not rupture under 5 blows from a height of 34 feet, and the deflection from the first blow must not exceed 8 inches. The axle is turned over after the first and third blows. Some specifications require the axle to be turned over after each blow. Height of fall varies with diameter of axle.

Car-Wheel Tests.

The wheel is usually held on three supports, not more than 5 inches wide, resting on a rubble foundation 2 feet deep. The common specifications for 33-inch wheels are: Weight of hammer, 140 pounds; weight of anvil, 1,700 pounds; ten blows to be delivered from a height of 12 feet, on center without rupture. The number of blows is varied with the size and weight of the wheel.

Rail Tests.

The usual conditions for rail tests are as follows: Span, 3 feet; length of specimen, 4 feet; about one piece in 100 tons tested; weight of hammer, 2,000 pounds; weight of anvil (Carnegie) 5,940 pounds; base-plate, 4,250 pounds.

The Northern Pacific Railroad specifications require a rail butt from each conversion to be placed either head or base upwards on solid steel or iron supports, the distance apart of which is 3 feet for sections up to and including 70 pounds, and 4 feet for all heavier ones. The hammer weighs 2,000 pounds and falls freely from a height of 16 feet for 70-pound, and 20 feet for all heavier rails. The rail must not break under one blow.

Cast-Iron Tests.

The Baltimore and Ohio Railroad specifications for locomotive castings require drop test specimens, one inch square and 13 inches long, to be tested in the rough, resting on firm supports 12 inches apart. Specimens must stand 5 blows of a ten-pound weight, striking midway between the supports, the first blow being from 15 inches for castings, requiring special strength, and from 12 inches for ordinary locomotive castings. The height of fall is increased one inch for each blow succeeding the first.

At the Pencoyd Iron Works impact tests are occasionally made on cast-iron specimens, which are 1 inch square and 14 inches long. A guided hammer, whose weight is 100 pounds, strikes the specimen midway between the supports, which are 12 inches apart. Beginning with a drop of three-fourth inch and increasing this one-sixteenth inch each succeeding blow, the test is continued to rupture. The resistance to impact appears to be extremely variable, fracture occurring at an average drop of $1\frac{3}{4}$ inches, with a range of from 1 to $2\frac{3}{8}$ inches. In the standard transverse test a similar specimen, similarly supported, must sustain a pressure of 2,400 pounds, and deflect $\frac{15}{100}$ inch before fracture. The material has an average tensile strength of 16,000 pounds.

At the works of the Bethlehem Iron Company impact tests are used, but not for the purpose of satisfying specifications. The specimens used are $\frac{1}{2}''$, $\frac{3}{4}^{\circ}$ and $\frac{7}{8}''$ square, 5, 6 and 8 inches long. Specimens are cut from forgings, and also rolled to size. The hammer weighs 40 pounds and the anvil one ton.

Car-Coupler Tests.

The drop test for couplers, adopted by the Master Car Builders' Association,. requires the use of a machine with spring foundation. The foundation of the proposed machine is of brick, 8 feet by 8 feet at top, 12 feet by 12 feet at bottom, and 8 feet deep. On this foundation is a cut stone cap 6 feet by 6 feet by 18 inches. Bolted through to the foundation and resting on this cap is a 5-foot by 5-foot by 4-inch cast-steel foundation plate. A $\frac{1}{8}$-inch layer of sheet lead is interposed between this stone cap and the cast-steel plate.

Twelve springs of specified quality and size are interposed between the foundation plate and the anvil, which is a cast-steel block in a cast-iron anvil, the mass weighing 24,000 pounds and of dimensions: 5 feet by 5 feet by 27 inches. The cast-steel hammer weighs 1,640 pounds.

Blows are struck on the knuckle and on the guard arm while the coupler is wedged in upright position with shank resting on the anvil. The specifications give the number of blows to break the knuckle, or cause cracks of definite size, or distort the shank, or to close the knuckle a specified amount.

Provision is made in the machine for what is called the jerk test. For this purpose two cast-steel pedestals, on opposite side of the machine, anchored to the anvil, carry yoke forgings. Between these yoke forgings and the pedestals, springs are interposed. A coupler is hung to each pedestal by the yoke forging, and an "equalizer bar" connects the two couplers, resting on the closed knuckles. The hammer strikes this equalizer bar. The specifications state the number of blows to break the knuckles, or to cause cracks, or to open the knuckle.

A pulling test for complete couplers, and a separate fall test on the knuckle, when the latter is laid horizontally on the anvil, accompany the tests mentioned.

In general, shock tests are not made at a temperature below 32° F. It is to be observed, also, that the axle test, as conducted, does not simulate the conditions of service.

German Commercial Tests.

Late German practice in testing manufactured forms for railroad work has been analyzed by Martens. The following is a brief synopsis:

Rails.

Supported length, 1 metre; length of specimen, 1.3 m., without fish-plate holes. The deflection is measured at the upper surface with reference to a length equal to the span. In late practice cushion blocks are not prescribed. The energy of the blow is specified at 1,500, 1,000 or 750 kg. m. for rail weights of over 23.8, 20 to 23.8, and 16 to 20 kg. per running metre, respectively.

The extension or compression on the surface of the rail is measured by means of a scale marked on the rail before testing.

Martens recommends a study of the scale forms which appear on the surface of test pieces. These are closely allied to structure and chemical composition. The forms are alike for impact and slow tests.

Axles.

Length of support, 1.5 m.; energy of blow, 3,000 kg. m.; test piece not turned over. For locomotive axles, energy of blow, 5,600 kg. m. (7 m.×800 kg.). Tender axles, 4,200 kg. m. (7 m.×600 kg.). The deflection is measured at the upper surfaces as in rail tests.

Tires.

Tested in upright position with blow of 3,000 kg. m. Diminution of inner vertical and increase of inner horizontal diameter measured after each blow. Blows continued until a specified deflection of inside diameter is reached. Thermal conditions to be noted. Tension tests to accompany impact tests on pieces least bent by blow.

In the *Vorschriften für Lieferungen von Eisen und Stahl, aufgestellt vom Verein Deutscher Eisenhüttenleutte, 1893*, drop tests are specified for rails, tires, and axles.

For Rails.—Drop tests for rails are to be made upon a legally gaged drop-testing machine. Supports to be one meter apart. One blow, the energy of which shall not be less than:

For rails of	130	mm. height, and over	30	kg. wt. per m.	3,000	kg.m.
" " "	120	" " " "	27	" " "	2,000	" "
" " "	110	" " " "	23	" " "	1,500	" "
" " "	100	" " " "	20	" " "	1,200	" "

to be applied and the test continued with blows of 1,200 kg. m. until rails of 130 mm. height have deflected 110 mm. For rails of a height other than 130 mm. the deflection shall be measured proportional to such heights of rails. The test is to be discontinued if the test piece deflects sideways before the minimum deflection of 110 mm. is obtained.

For Tires.—Drop tests on tires to be made on a legally gaged drop-testing machine. Blows, equal to 3,000 kg. m. to be continued until the tire has deflected 12 per cent. of its inside diameter. The material is not to show any cracks before this per cent. of deflection is reached.

For Axles.—Drop tests on axles are to be made on a legally gaged drop-testing machine. Supports to be 1.5 m. apart. Blows of 3,000 kg. m. to be delivered until axles of 130 mm. diameter show a deflection of 200 mm. measured between punch marks, originally 1.5 m. apart. On axles of diameters, other than 130 mm. diameter, the minimum deflection shall be measured proportional to the diameter.

The committee sent out circulars, of a form shown in the Appendix, to prominent railways and manufacturing plants, to leading technical schools, and to engineers likely to be interested in impact tests. On the whole, the returns evinced a not very lively interest in the matter of impact tests, but unexpected uniformity of practice. Commercial tests were found to be practically limited to rails, axles, couplers, and car wheels.

Respectfully submitted,

W. Kendrick Hatt.
Edgar Marburg.

APPENDIX.

The subjoined list of questions was sent out to:

29 Railroad Officials,
15 Manufacturing Plants,
15 Technical Schools,
10 Engineers,
3 Others. Total 72.

1. Company represented..............................
2. Kind of impact test (tension, compression, flexure)........
3. Piece tested (as for instance, test-bar, axle, rail, etc.)......
4. Size of piece....... ....
5. How selected..............................
6. How treated or prepared for tests.....................
7. Disposition of supports..........................
8. Disposition of piece on supports......................
9. Temperature at which tests are made..................
10. Foundation..................................
11. Soil......................................
12. Weight and size of hammer.......................
13. Weight and size of anvil........................
14. Guides....................................
15. Height of fall...............................
16. Specifications to which material must conform...........
17. Opinion as to the value and application of impact tests....
18. Persons of whom inquiries might be made...............

Replies were received from:

12 Railroad Officials,
9 Manufacturing Plants,
6 Technical Schools,
6 Engineers,
2 Others. Total 35.

Of these a total of 18 yielded information:

6 Railroad Officials,
5 Manufacturing Plants,
4 Technical Schools,
3 Engineers.

Some of the opinions expressed in reply follow:

From Paul Kreuzpointner, Pennsylvania Railroad:

"As to my personal non-authoritative opinion on the value of impact tests, I hold that whatever structural material is subjected to shocks and tremors, should be subjected to some kind of impact test, that is dynamic test. By this I mean the application of a blow, or blows, sudden enough to prevent the particles of the metal from preparing, or adjusting themselves, partly, or wholly, to receive or cushion the force of impact. The answer to the question why this should be so, we find in the structure of iron and steel. For the same reasons I consider the static force of a slow pull, as exerted in the testing machine for tensile test, as inadequate and useless as a means of determining the shock-resisting capacities of iron and steel. This conviction has been forced upon me not by a few isolated experiments, but by the every-day experience of testing hundreds of thousands of tons of iron and steel of different grades and makes for now over seventeen years in the test room of the Pennsylvania Railroad. Almost every day I make some nicking, or nick-bending or bending tests of materials, old or new, but mostly new, which had been tensile tested and about whose other qualities and structure wanted to know something. A metal which adjusts itself under the slow pull of a tensile test and meets specifications for strength and elongation nicely is by no means always able to transmit and distribute through the mass of the metal, from particle to particle, the violent vibrations and tremors caused and set in motion on the circumference of the metal, with sufficient rapidity so as to prevent overstrain, or rupture, of portions of the metal, before the other portions have had time to take part in the work of resisting the extraneous forces tending to destroy the metal. This experience does not only refer to steels of the axle grade, but also to that of boiler grade and wrought iron. There are some things about iron and steel, particularly the latter, which are matters of course to the very few experts who have the opportunity to constantly handle large masses of metals and to study their inner consciousness, as it were, but which are looked upon as mysteries by the average engineer, or are brushed haughtily aside as non-essentials, or because they cannot be squeezed into the straight-jacket of mathematical rules and formulas."

From A. N. Talbot, Professor of Municipal and Sanitary Engineering, University of Illinois:

"Of great value for pieces subject to impact, and for brittle and uneven material. In these and in other cases, there is urgent need of thorough investigation of the phenomena."

From J. E. Greiner, Engineer of Bridges and Buildings, B. & O. R. R.:

"Rail impact tests are valuable only for purposes of comparison of different rollings."

From F. A. Delano, Superintendent of Motive Power, C. B. & Q. R. R.:

"My opinion of impact tests is that they are excellent for any material which in use is subjected to impact, and I think that all tests should be made to conform as closely as possible to service conditions."

From N. Y. C. & H. R. R.:

"Valuable to a limited extent in determining comparative quality and workmanship in axles."

From the Engineer of Tests, Bethlehem Iron Company:

"Will no doubt be of considerable value when thoroughly understood and will admit of more or less application."

From J. R. Onderdock, Engineer of Tests, B. & O. R. R.:

"Impact tests good for pieces subject to shock and sudden strains, but when made on steel should be accompanied with chemical tests."

From Report of the American Foundrymen's Committee on Standardizing the Testing of Cast Iron:

"It is regretted that no machinery is available for reliable impact tests, our committee deeming this method of testing a most important one, the only one in fact giving a true insight into the resistance of cast iron to shock. The future will doubtless bring this test forward more prominently, but whether in time for our work or not can not yet be said."

From Dr. R. Moldenke, Superintendent Pennsylvania Malleable Company:

"I consider the impact test as a most important one, for a great majority of finished materials in service fail through vibration or shock. Special study should, however, be directed to carrying out impact tests in better conformity with the teachings of actual service failures. Thus, in the tests made upon couplers both pulling and drop, the failures observed are not comparable with actual breakages, as seen on the scrap pile. Perhaps a closer study will account for some of this. The heaviest breakages in couplers, guard arms excepted, is in the lugs. An inspection of tens of thousands of these breakages would give an impression that they were all pulled off, and yet close investigation reveals the fact that 80 per cent. were first battered up, by impact, and then pulled through the cracks. Here is explained the tendency to call for high tensile strength, when really what is wanted is high resistance to impact. I should be glad to see impact tests developed on two lines. First, on test specimens, and second, on finished work. On the tests specimen I would prefer the blow delivered at the free end of a tightly fixed bar as more nearly the situation in actual service."

From A. S. Vogt, Mechanical Engineer, Pennsylvania Railroad:

"We can only add that we believe for certain classes of material the impact test is the only one that gives results of value. For the axle test, as conducted for many years, we concluded that much was to be desired, owing to the uncertain quantity of the resistance offered by the anvil and foundation, our attention having been called to various cases where the results of drop tests of axles of the same height were so divergent that they could only be ascribed to the difference in resistance. It was evident that this resistance would also vary on the same drop-test machine, owing to the resistance being very much greater on the ground when the anvil was frozen. It was also evident that due to variations in the different soils where axle drop-test machines might be placed, the results could not be compared one with the other, and, therefore, it was decided that for the sake of unformity the resistance due to the nature of the soil should as far as possible be eliminated, and it was determined that the resistance to impact would be the mass of the weight of the anvil itself, and that this anvil should be supported on springs, so as to be as nearly as possible independent of the variations in the soil, and this is the principle embodied in our present axle testing machine. Machines embodying this principle are now to be found at Altoona, Pa., in the works of this Company; Midvale Steel Works, Philadelphia, Pa.; Pencoyd Iron Works, Philadelphia, Pa.; Otis Steel Co., Cleveland, Ohio; Pittsburg Forge and Iron Company, Pittsburg, Pa.; Carnegie Steel Company, Pittsburg, Pa.; Keystone Axle Company, Beaver Falls, Pa.; and probably also the Block-Pollak Iron Company, at Cincinnati, O. We believe from the results obtained that the shock test reveals the defects in the heat treatment, which defects can not be shown in any way by tensile tests."

From Dr. Charles B. Dudley, Chemist, Pennsylvania Railroad:

"Our judgment in this matter is this: As we are getting more and more experience all the time, we are constantly trying to test the material just as we put it in service, rather than a piece of it, that is to say, we test a whole axle, rather than a piece cut out of it, we test a whole car wheel, rather than a fragment of it, and so on. Obviously for this purpose either very large testing machines are required, or else we must use the impact test. We have accordingly expanded quite a little in recent years, in impact testing, and with the construction of machines which the Pennsylvania Railroad requires, we are inclined to think that the impact test is a genuine, scientific test, provided, of course, deflection is taken as one of the elements. In our judgment impact testing will continue to increase,

From Max H. Wickhorst, Engineer of Tests, C., B. & Q. R. R.:

"Impact tests are used by railroads in buying wheels, axles, and automatic car couplers and they have decided value for the purpose of keeping material up to a predetermined standard. For instance, our company some time ago placed an order with a firm for some steel M. C. B. car couplers, which had not before supplied us with any couplers; although they were very confident that they could furnish material to stand our tests; still, when I came to make actual tests with the drop machine, the material failed requirements and I rejected the lot. This resulted in a change in their foundry organization and method of keeping records, and when, afterwards, couplers were presented for inspection, the required samples stood the drop test satisfactorily. This is a case where the impact test was used to elevate the standard of quality of an important commercial article turned out by this firm."

From Thos. D. West, Foundry Expert, Sharpsville, Pa.:

"In replying to the request for views and experiences on impact tests, the writer would give it as his opinion that when it is practicable to apply such tests to castings, after the methods used in testing car-wheels, he considers that they will indicate fairly what may be expected of such castings when subjected to shocks or slight changes of temperature.

"Impact tests on the side of test-bars, the writer considers of no value in denoting what may be expected of castings, unless experience with castings made from the same mixture has shown what may be expected of them, and a record is kept of the contraction and analyses of mixtures. This necessity of first know-ing what a special form of casting will stand in actual service, before an impact test-bar record can be of any value as a comparative measure, causes impact tests on test-bars to be a very roundabout way of obtaining knowledge.

"It is sometimes thought that if test-bars prove strong under impact tests, castings made from the same iron will resist shocks or jars to an equal degree. But the property of castings to resist shock, is as a rule, as much dependent upon their form and proportions as upon the grade of the metal. In fact, castings may be constructed from iron showing the weaker result in test-bars, which will prove stronger under impact tests or usage. This is due, first, to the fact that strong or hard iron possesses a greater contraction than weak or soft iron, and, second, that light bodies will contract more than heavy ones, made from the same iron. In illustration, the writer would call attention to experiments which he conducted to find the difference in the contraction of two castings, each 14 feet long, one being $\frac{1}{2} \times 2$ inches, and the other 4×9 inches in cross section. Both pieces were poured of the same iron and at the same time. This experiment gave a contraction of $1\frac{3}{4}$ inches for the light and seven-eighth inch for the heavy body; *i. e.*, the light body contracted as much again as the heavy one.

"Considering that the lighter parts of castings possess a greater contraction than the heavier parts, if left free to act, as proven by the tests just cited, it will be seen that an internal strain must exist in all such castings. Again, when we consider that strong or hard iron possesses a greater contraction than soft or weak iron, we are forcibly brought to discern why iron that shows exceptionally strong results in a test-bar may cause a casting to crack from the least jar or change of temperature. On the other hand, as soft or weak iron possesses a lower contraction, thus causing lower internal strains in castings, it will often stand much rougher usage than the test-bars would indicate."

ANNOUNCEMENT

OF THE

PUBLICATION COMMITTEE.

At the second Annual Meeting of the American Section, held on August 15 and 16, 1899, contributions amounting to $200 were made as the nucleus of a Fund for Publication and Research. Additional gifts have since been received, which have increased the Fund to $345. All persons desiring to contribute to this Fund are invited to address the Treasurer of the American Section, Paul Kreutzpointner, Altoona, Pa., and information regarding the work of the Association may also be obtained from the undersigned. A list of contributors to the Fund will be published in Bulletin No. 6.

MANSFIELD MERRIMAN,
Lehigh University, South Bethlehem, Pa.

RICHARD L. HUMPHREY,
City Hall, Philadelphia, Pa.

JAMES M. PORTER,
Lafayette College, Easton, Pa.
Publication Committee.

INTERNATIONAL ASSOCIATION FOR TESTING MATERIALS.

AMERICAN SECTION.

BULLETIN No. 6. NOVEMBER, 1899.

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SECOND ANNUAL MEETING OF THE AMERICAN SECTION.

The Second Annual Meeting of the American Section of the International Association for Testing Materials, took place at Pittsburg, Pa., on August 15 and 16, 1899. Three sessions were held at the rooms of the Engineers' Society of Western Pennsylvania. The following members were in attendance:

American Foundrymen's Association, represented by R. G. G. Moldenke.
American Society of Mechanical Engineers, represented by Gus. C. Henning.
Bethlehem Iron Company, represented by Maunsel White and H. F. J. Porter.
Cambria Steel Company, represented by Geo. E. Thackray.
Carnegie Steel Company, Limited, represented by John McLeod.
Robert A. Carter, Monongahela Iron and Steel Co., Pittsburg, Pa.
James Christie, Pencoyd Iron Works, Pencoyd, Pa.
William K. Hatt, Purdue University, Lafayette, Ind.
Gus. C. Henning, Consulting Engineer, New York, N. Y.
Richard L. Humphrey, Engineer of Tests, Philadelphia, Pa.
Illinois Steel Company, represented by P. E. Carhart.
J. J. Kaylor, Inspecting Engineer, Allegheny, Pa.
J. F. Kinkead, Chicago & N. W. Railway Co., Pittsburg, Pa.
Paul Kreuzpointner, Pa. R. R. Co., Altoona, Pa.
Edgar Marburg, University of Pa., Philadelphia, Pa.
Mansfield Merriman, Lehigh University, South Bethlehem, Pa.
Richard G. G. Moldenke, Consulting Engineer, Pittsburg, Pa.
Frank C. Osborn, Civil Engineer, Cleveland, O.
James M. Porter, Lafayette College, Easton, Pa.
Railroad Gazette, represented by Gus. C. Henning.
Francis S. Rice, Keystone Bridge Works, Aspinwall, Pa.
Herbert A. Schaffer, Vulcanite Cement Works, Phillipsburg, N. J.
Arthur N. Talbot, University of Illinois, Champaign, Ill.
Technischer Verein of New York, represented by P. A. Lange.
Technischer Verein of Pittsburg, represented by P. A. Lange and A. Schotte.
William R. Webster, Civil Engineer, Philadelphia, Pa.
Thomas D. West, Foundry Expert, Sharpsville, Pa.
Max. H. Wickhorst, C. B. & Q. R. R., Aurora, Ill.

There were present a number of visitors, among them representatives of the Carbon Steel Company, and the Coatesville Iron and Steel Company and also officers and members of the Engineers' Society of Western Pennsylvania.

FIRST SESSION.

The meeting was called to order at 10.30 A.M. on Tuesday, August 15, by the chairman, Mansfield Merriman.

The minutes of the First Annual Meeting were approved as printed in Bulletin No. 1.

REPORT OF THE SECRETARY.

The Secretary, Richard L. Humphrey, presented the following report:

Since the formation of the American Section at the meeting held June 16, 1898, at Philadelphia, Pa., the membership has increased from 70 to 128, or about 75 per-cent, with only one resignation.

The total receipts and expenditures from June 16, 1898, to August 15, 1899, have been as follows:

Receipts.			
Dues, 1898		$ 6.00	
Dues, 1899		281.00	
Subscriptions to "Baumaterialienkunde"		10.00	
			$297.00
Expenditures.			
Secretary's Office:			
Postage, telegrams, expressages, etc	$33.24		
Printing history, by-laws, membership blanks, etc	66.05		
Printing Bulletins Nos. 1–2–3	31.25		
		$130.54	
By cash, Gus. C. Henning, 10/10/98	$ 3.00		
" " " " " 2/15/99	24.00		
" " " " " 2/16/99	3.00		
" " " " "	108.81		
Credit " " "	3.00		
		141.81	
By cash Paul Kreuzpointner		24.65	
			$297.00

The Executive Committee has held five meetings since the first annual meeting. At the New York meeting the secretary was authorized to issue a pamphlet to contain a list of the officers and members, the history and by-laws and the American and International Committees. At the meeting held at Bethlehem the Secretary was authorized to issue at regular intervals a bulletin to contain an abstract of the minutes of the meetings of the American Section and its Executive Committee, and other matters of interest to members of the American Section. Three bulletins have been thus far issued.

The Executive Committee, besides making appointments on the various International Committees, has created three American Committees, known as Committees B, C, and D. Many of these committees have organized, mapped out a plan of investigation, and it is expected that they will report at the next annual meeting.

The report of the Secretary was received and placed on file.

Report of the Treasurer.

The Treasurer, Paul Kreuzpointner, presented the following report :

Total receipts		$297.00
Expenditures :		
Secretary	130.54	
By cash International Association	141.81	
Balance on hand	24.65	
		$297.00

The report of the treasurer was accepted and placed on file.

A motion was adopted that the Executive Committee be requested to appoint two auditors to examine the accounts of the secretary and treasurer at the close of the year 1899.

Report and Action on the Congress of 1900.

Mr. Gus C. Henning, American member of the Council of the International Association, presented a report on the proposed Congress at Paris in 1900. The report, after reviewing the circumstances which led up to the invitation extended by the French government to the International Association to hold its next Congress in Paris in 1900, stated that the French government now extended an invitation to the International Association for Testing Materials to participate in the Exposition Congress, as individuals, and was not inclined to allow the Congress of the Association to be held. Mr. Henning in conclusion stated that, in his opinion, if the French government would not permit the Congress of the Association to be held in Paris in 1900, the Congress should not be abandoned, but should be held elsewhere.

Professor Marburg moved that the matter be referred to a committee to be appointed by the chairman. This motion was not adopted.

Mr. McLeod thought the invitation of the French government should be treated as any other invitation, and that the question resolved itself into a question of an acceptance or declination of the invitation. If it was not possible to hold a congress at Paris then he thought it should be held elsewhere and personally he thought Brussels far more preferable than Paris.

Professor Talbot did not see anything in the invitation which would indicate that the proposed congress could not be held as arranged.

Mr. Henning maintained that the halls suitable for holding conventions were under the control of the government, so that without the government's consent it would be impossible to hold the congress at Paris except under the auspices of the authorities of the Paris Exposition.

Mr. McLeod thought that the Exposition Congress would have its own business to transact, and that the International Association should hold its congress in Paris or elsewhere and transact its business.

Mr. Webster endorsed Mr. McLeod's views and requested him to embody them in the form of a motion.

Mr. McLeod then proposed the following resolutions :

Resolved: (1) That it is the sense of the American Section that Resolution Number 2 of the resolutions adopted at the meeting of the International Council held at Paris on May 12-13, 1899; viz., "In case the French authorities should send an invitation to the International Association inviting it to participate at the French Congress, the Association accepts on the condition that the International Association will have a hall at its disposal in order to hold a general session to discuss its own affairs," be endorsed.

Resolved: (2) That in the event of the conditions of Resolution Number 2 not being fulfilled, it is the sense of the American Section that the International Association should hold a congress in 1900 at some place to be selected by the International Council.

Mr. Christie thought no step should be taken to create friction or to increase the friction now existing. He could not see anything in the resolutions under consideration that was objectionable. He thought Brussels a good place to hold the congress since it would be neutral.

Professor Marburg proposed the following amendment which was accepted by Mr. McLeod :

Further that nothing in the foregoing shall be construed as being opposed to the acceptance of any invitation to the members of the International Association that has or may be tendered to the International Association to attend the sessions of the French Congress as individuals.

The resolutions as amended were unanimously adopted.

MISCELLANEOUS BUSINESS.

A communication was presented from the Technischer Verein of Pittsburg, stating that Mr. Philip A. Lange had been appointed to represent it at the Pittsburg meeting, with Mr. A. Schotte as a substitute.

A letter was also read from the Technischer Verein of New York, appointing Mr. Philip A. Lange as its official delegate.

Mr. Gus. C. Henning and Dr. Richard G. G. Moldenke presented their credentials as the official representatives of the American Society of Mechanical Engineers and the American Foundrymen's Association respectively.

A letter was presented from the Westinghouse Machine Company extending an invitation to the members and guests of the American Section to visit the company's shops any time that was convenient.

A communication was read from Prof. W. E. Goldsborough, of Purdue University, requesting the appointment of a committee to report on the magnetic properties of iron and steel. On motion the appointment of such a committee was approved.

Letters were read from the city officials of Saratoga, Detroit, and Chicago, inviting the American Section to hold the next annual meeting in these cities.

A letter was read from Robert W. Hunt and Company stating that they considered the date selected for the second annual meeting was a very unfortunate one, since it came at a time when so many people were seeking rest and when the weather at Pittsburg is at the very hottest. The consideration of the place for holding the next annual meeting was postponed.

Comparison of Steel Plates in Flexure and Tension.

Prof. William K. Hatt presented a paper giving the results of comparison of steel plates in flexure and tension. The following is an abstract of the paper; a fuller abstract may be found in the *Railroad Gazette*, of September 8, 1899.

Nine steel bars were rolled at different mills for the writer who had the bars planed off on four sides in order to remove the skin. Strips of material were cut off the side of each bar and these strips were turned down to tension specimens three-quarters of an inch in diameter. The bars themselves, after having been further cut up into other smaller bars, were tested in flexure.

A comparison of the proportional elastic limit, yield point, modulus of elasticity in flexure and tension was made. The summary of results is given in following table, from which it may be seen that the elastic limit in flexure is about one and a half that in tension in case of material of the quality and cross section of these bars.

Table of Average Results.

	Series I.	Series II.	Series III.
Elastic limit flexure	48580	31470	39250
Elastic limit tension	32000	22300	27833[1]
Thickness of bar	1.03 in	1.6 in	1.6–1.4 in
Width of bar	6.5 "	6.1–1.5 "	11.9–7.4 "
Span of bar	28.0 "	52–24.0 "	22.0 "
No. of tests of each kind averaged	4	6	3

The ratio of the yield points of flexure and tension was not different from the ratio of the elastic limits.

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[1] This result in Series III is yield point.

The results of the tension tests were compared with the reports from the mill on specimens "cut from bars;" and no important differences in ultimate strength, or per-cent of elongation, were observed,—considerable differences in the value of the yield point were, however, observed. In case of series No. I, II, and III the differences between the laboratory and mill yield point were 1,350, 13,375, and 8,200 lbs. per sq. in., respectively.

Tension tests on strips taken from the interior of and surface of a bar in Series No. II, showed great difference of quality throughout the depth of the plate near the edge.

The explanation of the higher elastic strength in flexure was in the consideration that the material of the "outer fibre" of the surface of a beam in flexure is supported by the material immediately below.

Consequently the natural or tensional elastic limit of the surface outer fibre is postponed. This higher value of the flexural elastic limit is a function of the shape of the cross section and of the material. As the breadth of the beam diminishes and the depth increases, the ratio of the elastic limit in flexure to that in tension will be smaller. In case of hard metals the ratio will be unity. The observations of other experimenters were quoted, confirming these tests.

In case of Series No. III special care was used to determine the modulus of elasticity. For the wide plates of this series the modulus was 29,300,000 in tension and 30,400,000 in flexure, thus indicating the effect of side constraint during the bending of the surface fibres of the bar.

This paper was discussed by Messrs. Christie, Talbot, Marburg, White, Henning, Webster, McLeod, Kreuzpointner, and Hatt.

Mr. McLeod announced the program for the visit to the Edgar Thomson Steel Works, stating that the train left Union Station at 2.15 P.M.

The first session adjourned at 12.30 P.M.

Inspection Visit.

During the afternoon of August 15, many of the members availed themselves of the opportunity of visiting the Edgar Thomson Works of the Carnegie Steel Company located at Bessemer, two miles east of Pittsburg. These works have an annual capacity of 650,000 tons of steel rails and billets and 500,000 tons of castings. The members were shown the entire process of the manufacture of steel rails and billets, from the raw material to the finished product. The Chemical Laboratory and the drop-testing apparatus were also inspected.

INFORMAL DINNER.

The members reassembled at the Monongahela House where an informal dinner was held at 6.30 P.M. Professor Merriman presided. Mr. Henning responded to a toast to Professor L. von Tetmajer, the president of the International Association. Other addresses were made by Messrs. McLeod, H. F. J. Porter, Kreuzpointner, Christie, and Moldenke.

SECOND SESSION.

The second session was called to order at 8.30 P.M. on Wednesday, August 15. There were fifty-three members and visitors present.

The Chairman, Professor Mansfield Merriman, delivered an address on "The Work of the International Association for Testing Materials." This address is printed in Bulletin No. 4, and it may also be found in *Engineering News* of August 17, in *The Railroad Gazette* of August 18, in *The Engineering Record* of August 19, in *Science* of September 22, and in *The Journal of the Franklin Institute* for October, 1899.

REPORT OF COMMITTEE NO. 1.

Mr. William R. Webster, chairman of the American members of Committee No. 1, on Standard Specifications for Iron and Steel, presented a preliminary report in which he stated that he thought the American Committee would be able to present a final report by the latter part of the present year, and suggested that the next annual meeting might be held in winter or early spring.

He stated that the twenty-one American members of this committee had organized and formed the following subcommittees, to each of which had been assigned the study of a particular group of specifications.

(1) On Bridge and Ship Materials; J. A. L. Waddell, R. W. Hunt & Company, Carnegie Steel Company.

(2) On Building Materials; James Christie, Frank C. Osborn, Professor William H. Burr, Cambria Steel Company, H. B. Seaman.

(3) On Rails; William R. Webster, R. W. Hunt and Company, Cambria Steel Company, Illinois Steel Company, Carnegie Steel Company, Pennsylvania Steel Company.

(4) On Boiler Material; H. V. Wille, Lukens Iron and Steel Company, Illinois Steel Company, Carnegie Steel Company, Central Iron and Steel Company, William R. Webster.

(5) On Axles, Tires, etc.; Bethlehem Iron Company, H. V. Wille, James Christie, Cambria Steel Company, Illinois Steel

Company, R. W. Hunt and Company, Carnegie Steel Company.

(6) On Forgings; Bethlehem Iron Company, H. V. Wille, Frank C. Osborn.

(7) On Castings; William R. Webster, James Christie, R. W. Hunt and Company.

On Wire; Cambria Steel Company.

On motion, the report of Mr. Webster was received and filed.

STANDARD TEST PIECES FOR FORGINGS.

Mr. White, chairman of Subcommittee (6) of Committee No. 1, reported that the subcommittee had decided to recommend the adoption of a bar two inches long and one-half inch in diameter, as a standard test piece for forgings. He personally favored this size as being the most satisfactory and yielding the best results.

Mr. Kreuzpointner opposed the recommendation of Mr. White as he had not found the result obtained from the two-inch specimen as reliable as those obtained from the eight-inch specimens. He thought the adoption of a two-inch specimen would be taking a step backward.

Mr. White said the United States government had made the most experiments of any consumer and as a result of its experience it had adopted the two-inch bar; instead of being a step backward it was, in his opinion, the advanced result of experience.

Mr. McLeod stated that his company was interested in the question of the tests of forgings. All tests in his opinion were relative. His experience had been obtained from the tests of two-inch bars; the Pennsylvania R. R. had until recently used two-inch bars. He was strongly in favor of Mr. White's recommendation for a two-inch bar.

Mr. Kreuzpointner stated that he had made in the last eighteen years over 40,000 tests on two-inch specimens and thousands of tests on eight-inch specimens, and he had found that the results of the eight-inch tests were far more satisfactory. He had heard many complaints from manufacturers that the two-inch specimens were entirely too small.

Mr. Webster stated that Mr. Kreuzpointner was apparently mistaken as to the intent of the subcommittee. They recommended the adoption of the two-inch specimen for large forgings.

Mr. McLeod wished to emphasize the fact that it was a mistake to throw away the fifteen years' experience gained on a two-inch specimen by the adoption of an eight-inch specimen.

Dr. Moldenke thought it was a question of adopting the specimen which gave the most satisfactory results irrespective of whether it was based on fifteen years' experience or one.

Mr. H. F. J. Porter stated that the Bethlehem Steel Works received specifications from all over the world, each specification requiring the test specimens to be of different lengths. He thought, therefore, that it was exceedingly desirable to have a uniform standard adopted and he hoped the American Section would recommend a standard test piece, either a two-inch or an eight-inch specimen, to the International Association.

Mr. Henning favored the eight-inch specimen as furnishing a truer indication of the quality of steel than the two-inch specimen. He maintained that if the committee wished to recommend the adoption of the two-inch specimen they should accompany the recommendation with a detailed description of the methods and apparatus for making the test. The recommendation should also be accompanied with proof that the results obtained from the two-inch specimen were more reliable and desirable than those obtained from the eight-inch specimens. This would be required by the International Association. In fact they would not consider the recommendation without this proof.

Mr. Wickhorst thought the larger the specimen the more representative was the test. It was not, however, practical to obtain an eight-inch specimen from some forgings. A two-inch specimen did not waste as much material as an eight-inch specimen.

The Chair closed the discussion by remarking that one of the objects of the Association was to establish a correct nomenclature for testing. He thought such a nomenclature was highly essential, as there was a confusion of terms in the discussion just closed. Professor Hatt also stated that he had found considerable difficulty, in digesting foreign literature, to find equivalent terms in the English dictionary.

The Chair announced that the question of the next annual meeting was still undecided. Dr. Moldenke moved that the Executive Committee be requested to decide the time and place for the next annual meeting, adopting, if possible, the recommendation of the Chairman of Committee No. 1. The motion was carried.

DISCREPANCIES IN COMMERCIAL TESTING.

Mr. Paul Kreuzpointner read a paper on the discrepancies in commercial tests when the same material was tested on different machines, of which the following is an abstract:

Even allowing for possible differences in the different specimens there is still enough of uncertainty and want of uniformity in results to warrant the conclusion that either the testing machines vary, or the measurements of dimensions are at fault, or the weighing is done carelessly, or the preparation of test pieces is defective. There may also be a combination of these and other factors. I have found that the use of different styles of micrometers at two different places, used by two different operators, caused rejection of the material in one place and its acceptance in the other, the main cause of such difference being a slight difference in the reading of the micrometers and a too hard screwing up of the micrometer by the operator while measuring the test pieces.

Difference in results of tests of the same coupons of boiler steel, each coupon being thirty-six inches long, one half of which, or a test piece of eighteen inches from each coupon, was tested on machines of similar build, but by different persons at two different places, A and B:

Number of tests, 142. Tensile strength.		Number of tests, 140. Elongation in eight-inch specimen.	
Pounds per square inch higher at A.	Per cent. of number of tests higher at A.	Per cent. of elongation higher at A.	Per cent. of number of tests higher at A.
1,000 pds. and less	30.8	1	30.8
2,000 " " "	26.7	2	10.3
3,000 " " "	10.8	3	10.7
4,000 " " "	6.2	4	10.0
5,000 " " "	3.5	5	0.8
6,000 " " "	1.4	6	0.5
7,000 " " "	1.4	7	0.2
8,000 " " "	2.1	8	0.1
9,000 " " "	...	9	0.1
10,000 " " "	1.4		
Total per cent. hgher.	84.3	Total per cent. higher.	63.5

In the above table are given the results of tests of boiler steel at two different places. Allowing for some error in the two machines and a certain difference in quality of the steel in different portions of the coupon, yet the results clearly point to some radical difference in method. This is proved by the tests on machine A being high both in strength and elongation.

Now this is a serious matter, unjust to both the manufacturer and consumer alike. It is evident that the personal equation of the operator, or operators, and the manner of preparing test pieces has something to do with such a showing. Fortunately the margin of acceptance is often sufficiently great to cover the larger part of such discrepancies. But this is no excuse for their existence.

One reason for this state of things is probably the lack of technical training of many of the operators who are charged with the duties of commercial testing. The work is often done in a purely mechanical way without any reference to the properties, or qualities, of the material tested. The influence of the method of preparing test pieces by slotting, milling, turning, or planing is not always understood. Too often the idea prevails that the main object of the operator is to break the largest number of test pieces in the shortest possible time.

As far as the want of technical knowledge is concerned we have no right to blame the young men who do the testing, as long as we do not provide schools where the necessary rudiments of technical knowledge may be acquired. In this respect we are far behind the times.

It would be not only a relief to the engineer, but also to the manufacturer if the American Section of the International Association for Testing Materials would, or could, bring about a uniformity in the methods of preparing test pieces, of the speed at which different classes of materials ought to be tested, of the manner and means by which the elongation and dimensions of test pieces are measured. It may be news to some of those present, but it seems to be an established fact that, for instance, violent jarring of the test pieces while milling them, may affect the results, if such test pieces are tested immediately after milling; just the same as the results are different of material tested the day it was rolled, or hammered, or the same material tested a few days after finishing. It is thus seen that there are great possibilities for reform in the line of commercial testing and inspecting.

In reply to a question Mr. Kreuzpointner stated that the party that obtained the highest elongation obtained also the highest tensile strength. Mr. Kreuzpointner also stated that the pulling speeds were the same in both cases.

Mr. Henning stated that Professor Martens had found in calibrating a machine originally correct, a variation of over sixteen per cent. This was due to changes produced by use.

Mr. McLeod stated that he had found great carelessness in the manner of placing test specimens in the machines. He had seen specimens in testing machines where the free surface was less than four inches.

Miscellaneous Business.

The Secretary announced that the Carbon Iron Company extended a cordial invitation to the members and guests of the American Section to visit their works on Wednesday at any time between 7 A.M. and 5 P.M.

Professor R. A. Fessenden, Secretary of the Engineers' Society of Western Pennsylvania, gave a ten-minute talk on the method of calculating the tensile strength of materials from their atomic weights and electric properties.

The second session adjourned at 10.30 P.M. An informal reception by the officers and members of the Engineers' Society of Western Pennsylvania closed the evening.

THIRD SESSION.

The final session was called to order at 10.20 A.M. on Wednesday, August 16.

REPORTS OF COMMITTEES.

Professor William K. Hatt, Chairman of the American Committee A, on the present state of knowledge of Impact Tests presented a preliminary report. This is published in full in Bulletin No. 5. The report was discussed by Messrs. Marburg, Talbot, Kreuzpointner, McLeod, Henning, Thackaray, Osborn and others. It was thought desirable to publish the report of the Committee on Impact Tests in full.

The list of committees was then called, and several presented verbal reports of progress. Some of the committees had hardly commenced their work owing to the lack of instructions from the European chairmen, or to lack of organization.

Committee No. 2, on uniformity of individual shipments of iron and steel, reported that no organization had been effected but that individual members had collected data, and that there was urgent need of certain experimental work.

Committee No. 5, on standard piece tests, reported that a circular letter had been sent out, and that specifications had been collected.

Committee No. 8, on the constancy of volume of hydraulic cements, reported that work had been started and that probably chemical tests would be found necessary.

Committee No. 10, on the adhesive qualities of hydraulic cements, reported that several meetings had been held and that work was in progress.

PUBLICATION AND RESEARCH FUND.

Professor James M. Porter stated he thought that the Association should publish a Journal and that he had several plans to suggest, the first was to solicit contributions from manufacturing companies and others. Second, to form a company for the publication, and third to defray the expenses by an increase in the dues. Of the different schemes the first seemed to be the most promising.

There was a general sentiment in favor of the scheme. Prof. Marburg moved that it be referred to the Executive Committee, with instructions to report at the next annual meeting.

The Secretary stated that he thought this would unnecessarily delay the project, as there would be need for some means by which the reports of the various committees could be printed and sent to the members in advance of the annual meeting. It was very desirable to have them printed in advance, so as to enable the members to prepare their discussions. He, therefore, thought it advantageous to have it started at once.

After considerable discussion of the subject, it was decided to establish a Publication and Research Fund, and the matter was referred to the Executive Committee with full power to act, and requesting them to endeavor to see whether the necessary money could not be raised by contributions.

Mr. Robert A. Carter, President of the Monongahela Iron and Steel Company, stated that he had been very much interested in the work of the Association and particularly in the present project: Further, that his deep interest prompted him to come forward with a contribution of $100. On motion a vote of thanks was given to Mr. Carter.

The Secretary announced that Professor James M. Porter had also subscribed $100 towards this fund, and on motion Professor Porter was given a vote of thanks.

Representatives of two steel companies announced that the Publication and Research Fund would undoubtedly receive the support of their firms as well as that of manufacturers in general.

Adjournment.

Mr. Kreuzpointner moved that a vote of thanks be given to Dr. Moldenke and to other members of the local committee for their labors in arranging for the comfort and entertainment of the American Section, as these had contributed so much to the success of the meeting.

A vote of thanks was also extended to the officers and members of the Engineers' Society of Western Pennsylvania for the courtesies extended to the American Section.

At 12.05 P.M. there being no further business, the chairman congratulated the members on the success of their discussions and deliberations, and declared the second annual meeting adjourned.

Inspection Visit.

The afternoon of August 16 was occupied by visits to the Pittsburg Testing Laboratory, to the Westinghouse Electric and Mfg. Co., at East Pittsburg, and to other industrial establishments.

MEETING OF EXECUTIVE COMMITTEE,

AUGUST 16, 1899.

A meeting of the Executive Committee of the American Section of the International Association for Testing Materials was held at the Monongahela House, Pittsburg, Pa., on Wednesday, August 16th, 1899, at 6.30 P.M. There were present Messrs. Merriman, Kreuzpointner, and Humphrey.

W. E. Goldsborough and John A. Capp were appointed members of the American Committee E "On the Investigation of the Magnetic Properties of Iron and Steel."

It was decided to constitute a Publication Committee to have entire charge of the preparation and publication of the Bulletins of the American Section. Mansfield Merriman, Richard L. Humphrey, and James M. Porter were appointed as that committee.

The Publication Committee was requested to issue, as soon as practicable, bulletins containing the Proceedings of the Second Annual Meeting.

James Christie and John McLeod were appointed to audit the accounts of the Secretary and Treasurer at the close of the present year.

MEETING OF EXECUTIVE COMMITTEE,

OCTOBER 21, 1899.

A meeting of the Executive Committee was held at the Engineers' Club, Philadelphia, Pa., on Saturday, October 21, 1899, at 3.30 P.M. There were present Messrs. Merriman, Henning, Kreuzpointner, and Humphrey. A letter was read from Vice-chairman Howe regretting his inability to be present.

The minutes of the last meeting were read and approved.

PUBLICATION AND RESEARCH FUND.

The Treasurer reported that the following contributions to the Publication and Research Fund had been received by him :

Logan Iron and Steel Company	$ 20.00
Central Iron and Steel Company	50.00
Carbon Steel Company	50.00
Standard Steel Company	25.00
Wayne Iron and Steel Company	50.00
Robert A. Carter	100.00
James M. Porter	100.00
Total	$395.00

He also reported that the Shoenberger Steel Company, now the American Steel and Wire Company, had promised to subscribe later.

On motion it was unanimously agreed to extend a vote of thanks to each of these contributors.

The chairman reported on behalf of the Publication Committee that Bulletins Nos. 4 and 5 were in press and would be issued shortly. Bulletin No. 4 will contain the address of the chairman delivered at the second annual meeting and Bulletin No. 5 will contain the report of the Committee on Impact Tests. These will be followed by Bulletin No. 6 which will contain the proceedings of the second annual meeting and of the meetings of the Executive Committee.

RULES OF THE EXECUTIVE COMMITTEE

The chairman called the attention of the committee to the desirability of formulating rules for the conduct of the business of the American Section. He proposed a series of rules, which, after discussion and amendment, were adopted as follows:

(1) Regular meetings of the Executive Committee shall be held on the first Saturday after the first Friday in January, April, July, and October. At each meeting the Secretary shall report the names of all members whose dues are unpaid and the names of all new members added during the previous quarter. The Treasurer shall present a financial statement at each meeting, and the auditors shall report at the January meeting. Special meetings of the Executive Committee may be held at any time on one week's notice by the chairman.

(2) On the last day of March, June, September, and December, the Secretary shall furnish the Publication Committee with the names and addresses of all new members, and also with all changes in addresses of members. The names and addresses of new members shall also be sent to the American Member of the International Council, together with their application blanks.

(3) On the last day of March, June, September, and December the Secretary shall transmit to the Treasurer a statement of all moneys received and paid out during the quarter and pay over to him the balance then on hand. All money paid out shall be vouched for by receipts, and such receipts must bear the certification of the chairman. The statement of dues received during the quarter shall be accompanied by the names of the members paying the same.

(4) The Treasurer shall keep two accounts, one to be called the General Fund, and the other the Publication and Research Fund. Within five days after the first day of January, April, July, and October, he shall transmit to the International Association $1.50 for each member whose dues were paid in the previous quarter together with the names of those members.

No other expenses shall be paid out of the General Fund except on vouchers certified to be correct by the chairman and Secretary. Payments shall be made out of the Publication and Research Fund only on vouchers certified to be correct by two members of the Publication Committee, except by special order of the Executive Committee.

(5) Three-fifths of the general expenses of the Secretary's office shall be charged to the International Association for Testing Materials, and shall be collected by the Treasurer.

Plans for the Third Annual Meeting.

It was decided to provisionally appoint the third annual meeting to be held in New York City between June 20th and June 30th, 1900, the assignment of the exact date being deferred until the meeting of the Executive Committee in January, 1900.

The Executive Committee then discussed matters relating to International Committee No. 1 with Mr. Webster and Mr. Christie, members of that committee.

Mr. Webster, chairman of the American members of this committee, stated that a full report would probably be made at the third annual meeting. He also stated that the American Society of Mechanical Engineers had a committee which had worked on similar lines and he thought the conclusions of the two committees should be harmonized; he, therefore, requested the Executive Committee to formulate some plan for cooperation.

After considerable discussion the following resolution was adopted:

Resolved: That Committee No. 1 be instructed to seek the cooperation of the Committee on Tests and Methods of Testing Materials of the American Society of Mechanical Engineers.

It was also decided that all committees should present reports at the third annual meeting, and, after discussion, the following resolution was passed:

Resolved: That all committees are required to make reports at the third annual meeting and that they are requested to hand these reports to the Publication Committee before May 1st, so that they can be printed and issued by June 1st, 1900.

Exposition Congress of 1900.

Mr. Henning, the American Member of the International Council, presented a report of that Council, held at Dresden, Germany, on Sept. 25-26, 1899, at which he was present. He stated that the resolutions adopted by the Council would be translated into English and a copy be sent by him to each member of the American Section. The following is a synopsis of those resolutions:

(1) The Council accepts the invitation of the authorities of the French Exposition Congress on Testing Materials which is to be held in Paris on July 9-15, 1900. Members are requested to cooperate with that Congress in furnishing papers and discussions.

(2) The Congress of the International Association for Testing Materials is postponed until 1901, or 1902 at the latest.

Mr. Henning also reported he had taken up the question of the complaints of American subscribers to the "Baumaterialienkunde" and that the officers of the International Association and the editor of this journal had promised to correct the trouble.

LIST OF MEMBERS.

ADDITIONS.

	Date of membership.
GRAVES, EDWIN S., Civil Engineer, Chief Engineer, Connecticut River Bridge and Highway District, 650 Main Street, Hartford, Connecticut.	Aug. 1899
KINKEAD, J. F., Inspecting Engineer, Inspector, Chicago and Northwestern Railway Company, 507 Smithfield Street, Pittsburg, Pa.	Aug. 1899
MARCH, H. J., Civil Engineer, Assistant Engineer, Department of Public Works, 13 City Hall, Buffalo, N. Y.	Aug. 1899
STILLMAN, THOMAS B., Chemist, Professor of Analytical Chemistry, Stevens Institute of Technology, Hoboken, New Jersey.	Sept. 1899

CHANGE OF ADDRESS.

JOHNSON, J. B., Civil Engineer,
Dean of College of Mechanics and Engineering,
University of Wisconsin, Madison, Wis.

ANNOUNCEMENT
OF THE
PUBLICATION COMMITTEE.

Attention is called to the list of contributions to the Publication and Research Fund given on page 67. This fund now amounts to $395. Corporations or persons desiring to subscribe to it are invited to send their contributions to the Treasurer of the American Section, Paul Kreuzpointner, Pa. R. R. Testing Laboratory, Altoona, Pa. Information in regard to the objects of the Association will be given by him or by the undersigned.

The attention of members of all Technical Committees is called to the resolution adopted by the Executive Committee on October 21, which is given on page 69. In accordance with that resolution all committees are notified that their reports for the Third Annual Meeting should be sent to the Chairman of the Publication Committee on or before May 1, 1900, in order that they may be printed and distributed at least three weeks before the annual meeting.

MANSFIELD MERRIMAN,
Lehigh University, South Bethlehem, Pa.

RICHARD L. HUMPHREY,
City Hall, Philadelphia, Pa.

JAMES M. PORTER,
Lafayette College, Easton, Pa.

Publication Committee.

INTERNATIONAL

ASSOCIATION FOR TESTING MATERIALS.

AMERICAN SECTION.

BULLETIN No. 7. JANUARY, 1900.

MEETING OF THE EXECUTIVE COMMITTEE.

January 6, 1900.

The stated quarterly meeting of the Executive Committee of the American Section was held on the above date at the House of the American Society of Mechanical Engineers, 12 West 31st Street, New York. The meeting was called to order at 2 P.M. Present: Messrs. Merriman, Howe, Kreuzpointner, and Henning. In the absence of the Secretary notes of the proceedings were taken by the Chairman.

The minutes of the last meeting, as printed in Bulletin No. 6, pages 67-70, were approved.

Report of the Secretary.

Reports from the Secretary, received through the Treasurer and the Auditors, showed that the following is a statement of his accounts since his report of August 14, 1899. (See Bulletin No. 6, page 55.)

Receipts from membership dues	$27.50
Expenditures for postage	3.00
Paid to Treasurer	$24.50

General Fund.

The Treasurer presented the following statement of his account with the General Fund, since his report of August 14, 1899 (See Bulletin No. 6, page 56):

Receipts.

Aug. 14, 1899,	Balance on hand	$24.65
Oct. 16, 1899,	Received from Secretary . . .	5.00
Jan. 2, 1900,	Received from Secretary . . .	19.50
Balance on hand, Jan. 3, 1900		$49.15

PUBLICATION AND RESEARCH FUND.

The Treasurer presented the following statement of his account with the Publication and Research Fund.

Receipts from contributions.

Aug. 18, 1899.	Robert A. Carter . .	$100.00	
Aug. 28, 1899.	Logan Iron and Steel Company	20.00	
Sept. 6, 1899.	Carbon Steel Company .	50.00	
Sept. 8, 1899.	Standard Steel Company .	25.00	
Sept. 27, 1899.	James M. Porter . .	100.00	
Oct. 14, 1899.	Wayne Iron and Steel Company	50.00	
Oct. 26, 1899.	Central Iron and Steel Company	50.00	
Nov. 29, 1899.	Robert W. Lesley .	20.00	
Nov. 29, 1899.	Bethlehem Steel Company .	100.00	
Dec. 1, 1899.	Altoona Iron Company .	100.00	
Dec. 4, 1899.	Milton Iron Company . .	10.00	
Dec. 9, 1899.	Shoenberger Steel Company	30.00	
			$655.00

Expenditures.

Dec. 2, 1899.	Printing and envelopes for Bulletins Nos. 4, 5, and 6 . .	$85.50		
Dec. 31, 1899.	Stationary and postage of Treasurer's office . .	4.15		
			$89.65	
Balance on hand, Jan. 1, 1900 . .				$565.35

REPORT OF AUDITORS.

The report of Mr. James Christie, for the Auditing Committee, was read, certifying that the accounts of the Secretary and Treasurer had been examined and approved.

REPORT OF THE PUBLICATION COMMITTEE.

The Chairman, on behalf of the Publication Committee, presented the following report :

"The Publication Committee respectfully reports, that since its appointment on Aug. 14, 1899, it has printed Bulletins Nos. 4, 5, and 6, a total of 55 pages, the number of copies of each being 1000. These have been distributed as follows :

	No. 4.	No. 5.	No. 6.
To authors	200	150	—
" members	110	110	110
" Executive Committee	24	30	30
" Advisory Councillors	6	6	6
" International Council	9	9	9
" the Secretary	50	50	50
" Engineering Journals	45	45	45
" Engineering Societies	45	45	45
" manufacturers	208	208	208
" Engineers not members	119	119	119
Total copies distributed	816	772	622
Copies on hand, Jan. 1, 1900	184	228	378
	1000	1000	1000

"The cost of these Bulletins, including 1,000 envelopes, was $85.50, which has been paid out of the Publication and Research Fund. The amount expended for postage and expressage was $13.44, the bill for which has not yet been rendered.

"We have also printed 1,000 membership blanks, with the By-Laws of the American Section attached, of which nearly 500 have been distributed with the Bulletins. The bill for these is $6.50, and we ask the Executive Committee to decide whether it shall be paid out of the General Fund or out of the Publication and Research Fund."

Action on Reports.

It was voted that the above reports be received, placed on file, and be printed in Bulletin No. 7.

It was voted that the bill incurred by the Publication Committee for printing membership blanks be paid out of the General Fund.

New List of Members.

The Executive Committee then discussed the question of printing a new list of members of the American Section. Mr. Henning stated that he had received from the International Council copies of a list of all members of the Association on June 1, 1899, which contains also the list of international committees. After discussion it was resolved that the Publication Committee be requested to print a supplementary list of new members who have joined the American Section since that date, insert one in each copy, make other necessary corrections, and mail one copy to each American member.

It was further voted that no other list of members of the American Section be printed this year, since the international list as amended furnishes all necessary information.

COMMITTEE No. 1.

A bill for $39.26 was presented by Mr. William R. Webster, Chairman of the American members of Committee No. 1, for expenses incurred by that Committee for stationery, printing, typewriting, and postage. It was ordered that the bill be paid out of the Publication and Research Fund. Mr. Henning stated that it was the custom of the International Association to defray the expenses incurred in research by the Technical Committee, and requested the Treasurer to render the Association, through him, a bill for the above amount.

A request was received from Committee No. 1, to add to its membership the American Steel and Wire Company, the National Tube Company, the Shelby Tube Company, the Standard Steel Company, and John A. Roebling Sons Company, or a representative from each. The request was granted, it being understood that these parties are to become members of the Association, if not so already.

It was further resolved, as it is the policy of the Association that its Technical Committees should be nearly equally divided between producers and consumers, that Committee No. 1 be requested to name five engineers not directly associated with manufacturing, to balance the five firms above mentioned.

WITHDRAWAL FROM MEMBERSHIP.

The case of a member in arrears for dues was discussed. In the absence of any rule relating to such cases, the Chairman was instructed to ask him if he desires to withdraw, and to say that if a reply is not received within one week it will be considered that he desires such action.

ANNUAL MEETING OF 1900.

The time of the Third Annual Meeting of the American Section was then discussed. A communication was received from Committee No. 1, stating that the date, June 20-30, provisionally appointed last October, was too late, inasmuch as the French Exposition Congress on Testing Material has been appointed for June 9. It was also stated that the American Society of Civil Engineers would hold its convention in London during the first week in July, and that many members of the American Section would leave for Europe early in June.

In view of these facts it was voted that the Third Annual Meeting of the American Section be held in September or October, and that the fixing of the exact date be deferred until the stated meeting of the Executive Committee on April 7, 1900.

CONTRIBUTIONS TO PUBLICATION AND RESEARCH FUND.

The Treasurer reported that he had received contributions to the Publication and Research Fund amounting to $260 since his report of October 21, 1899 (See Bulletin No. 7, page 67). The names of these contributors were read, as given above in the financial report, and the thanks of the Executive Committee were expressed.

NEXT MEETING OF THE EXECUTIVE COMMITTEE.

It was voted that the next stated quarterly meeting of the Executive Committee, on April 7, 1900, be held at 2.15 P.M., at the House of the Society of Mechanical Engineers, 12 West 31st Street, New York City.

LIST OF MEMBERS.

Additions.

	Date of membership.
Carbolineum Wood Preserving Company, C. S. McKinney, Manager, Park Row, New York, N. Y.	Dec. 5, 1899.
Corthell, E. L., Civil Engineer, 27 Pine St., New York, N. Y.	Dec. 20, 1899.
Daniels, Frederick H., Mechanical Engineer, Chief Engineer, American Steel and Iron Company, Worcester, Mass.	Dec. 26, 1899.
Janeway, J. H., Mechanical Engineer, John A. Roebling's Sons Company, Trenton, N. J.	Dec. 30, 1899.
Lowe Brothers, Paint and Color Makers, Huston Lowe ; Vice President, Dayton, O.	Dec. 15, 1899.
Meade, Richard K., Chemist, Assistant in Chemistry, Lafayette College, Easton, Pa.	Nov. 29, 1899.
Richter, A. W., Mechanical Engineer, Assistant Professor of Experimental Engineering, 428 Murray Street, Madison, Wis.	Jan. 5, 1900.
Shimer, Porter W., Chemist and Metallurgist, Easton, Pa.	Nov. 29, 1899.
Steinman, A. J., Manufacturer, Chairman Penn. Iron Company, Limited, Lancaster, Pa.	Dec. 5, 1899.
Thomas, David, Assistant Superintendent, Reading Iron Company, Danville, Pa.	Jan. 6, 1900.
Woolson, Ira H., Teacher, Instructor in Mechanical Engineering, Columbia University, New York, N. Y.	Jan. 1, 1900.

Changes of Address.

Benneville, James S. de, Analytical Chemist, University Club, 1510 Walnut St., Philadelphia, Pa.

HUMPHREY, RICHARD L., Civil Engineer,
Engineer and General Manager, Buckhorn Portland Cement Company, Girard Building, Philadelphia, Pa.

LUNDTEIGEN, ANDREAS, Chemist,
Union City, Mich.

MUESER, WILLIAM, Civil Engineer,
13-21 Park Row, New York, N. Y.

SHELLENBERGER, LOUIS R., Mechanical Engineer,
Helmer, Ind.

TECHNISCHER VEREIN NEW YORK,
William Meuser, Secretary, 13-21 Park Row, New York, N. Y.

WITHDRAWALS.

CARTER, OBERLIN M.
GERMER, OTTO.
MUMFORD, E. H.

BAUMATERIALIENKUNDE.

This Journal, published by Messrs. Stähle and Friedel, at Stuggart, Germany, contains the official announcement of the International Council in German, French, and English. It is issued semi-monthly, and the subscription price is $3.50 per year, but it will be furnished to all members of the International Association for $2.50 per year. Members of the American Section must send their subscriptions direct to the publishers by international money order, as hereafter they cannot be forwarded through the American Member of Council or through the Secretary.

ANNOUNCEMENTS.

Attention is called to the list of contributors to the Publication and Research Fund, given on page 74. The total amount thus far received is $655. Persons or corporations desiring to subscribe are invited to send their contributions to the Treasurer of the American Section, Paul Kreuzpointner, Pa. R. R. Testing Laboratory, Altoona, Pa. Information in regard to the objects of the International Association will be given by him or by the undersigned.

The attention of all Technical Committees is called to the necessity of having their reports for the Third Annual Meeting in the hands of the Chairman of the Publication Committee in ample time for printing and distribution. As this meeting will probably be held in the early part of October, it is desirable that such reports should be distributed not later than August in order to afford opportunity for the preparation of discussions.

In accordance with the action of the Executive Committee, stated on page 75, a copy of the list of members of the International Association, with a supplementary list of additions to the American Section to this date, is herewith mailed to each member.

Mansfield Merriman,
Lehigh University, South Bethlehem.

Richard L. Humphrey,
Girard Building, Philadelphia, Pa.

James M. Porter,
Lafayette College, Easton, Pa.

January 15, 1900.
Publication Committee.

INTERNATIONAL
ASSOCIATION FOR TESTING MATERIALS.

AMERICAN SECTION.

BULLETIN No. 8. MAY, 1900.

PROPOSED STANDARD SPECIFICATIONS
FOR
STRUCTURAL STEEL FOR BRIDGES AND SHIPS.

Recommended by American Branch of Committee No. 1, May 1, 1900.

There will be a discussion of these specifications at the Third Annual Meeting of the American Section, to be held in New York, on October 25-27, 1900, and you are requested to send in your views by letter, or to be present and take part in the oral discussion.

After the Annual Meeting, Committee No. 1 will consider the points raised, and make any modifications that may be found necessary; and, if so decided at the Annual Meeting, the specifications will be sent to all members of the American Section for approval by letter ballot.

If the other countries perform their work in the same general manner, the final work of the introduction of International Specifications will be reduced to a very simple matter, as there will only be a limited number of specifications to consider instead of hundreds as at the present time.

Wm. R. Webster,
Chairman of American Branch of Committee No. 1.

PROCESS OF MANUFACTURE.

1. Steel shall be made by the open-hearth process.

CHEMICAL PROPERTIES.

2. Each of the three classes of structural steel for bridges and ships shall conform to the following limits in chemical composition :

	Steel made by the acid process. Per cent.	Steel made by the basic process. Per cent.
Phosphorus shall not exceed	0.08	0.06
Sulphur shall not exceed	0.06	0.06

PHYSICAL PROPERTIES.

Classes.

3. There shall be three classes of structural steel for bridges and ships, namely : RIVET STEEL, SOFT STEEL, and MEDIUM STEEL, which shall conform to the following physical qualities :

4. **Tensile Tests.**

	Rivet steel.	Soft steel.	Medium steel.
Tensile strength, pounds per square inch	50,000 to 60,000	52,000 to 62,000	60,000 to 70,000
Yield point, in pounds square inch, shall not be less than	30,000	32,000	35,000
Elongation in per cent. eight inches shall not be less than	26	25	22

Modifications in elongation for thin and thick material.

5. For material less than five-sixteenths inch (5/16″), and more than three-fourths inch (3/4″) in thickness, the following modifications shall be made in the requirements for elongation :

(*a*). For each increase of one-eighth inch (1/8″) in thickness above three-fourths inch (3/4″), a deduction of one per cent. (1%) shall be made from the specified elongation.

(*b*). For each decrease of one-sixteenth inch (1/16″) in thickness below five-sixteenths inch (5/16″), a deduction of two and one-half per cent. (2 1/2%) shall be made from the specified elongation.

(*c*). For pins made from any of the three classes of steel, the required elongation shall be five per cent. (5%) less than that specified in paragraph No. 4, as determined on a test specimen the center of which shall be one inch (1") from the surface.

6. Eye-bars shall be of medium steel. Full-sized tests shall show 12 1/2 per cent. elongation in fifteen feet of the body of the eye-bar, and the tensile strength shall not be less than 55,000 pounds per square inch. Eye-bars shall be required to break in the body, but should an eye-bar break in the head, and show twelve and one-half percent (12 1/2%) elongation in fifteen feet and the tensile strength specified, it shall not be cause for rejection, provided that not more than one-third (1/3) of the total number of eye-bars tested break in the head.

Tensile Tests of Eye-bars.

7. The three classes of structural steel for bridges and ships shall conform to the following bending tests; and for this purpose the test specimen shall be one and one-half inches wide, if possible, and for all material three-fourths inch

Bending Tests

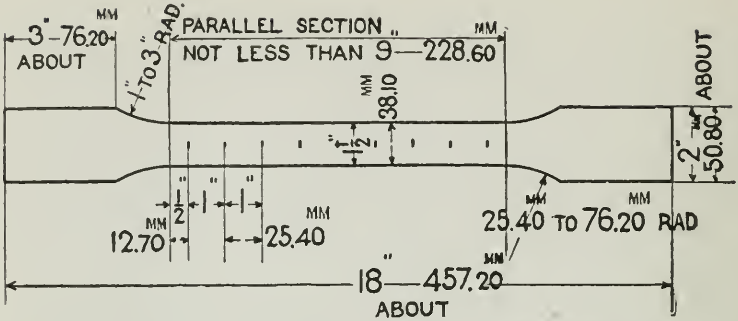
ture on the outside of the bent portion.

(*f*). Medium steel shall bend cold 180° around a diameter equal to the thickness of the specimen tested, without fracture on the outside of the bent portion.

TEST PIECES AND METHODS OF TESTING.

8. The standard test specimen of eight inch (8") gauged length, shall be used to determine the physical properties specified in paragraphs Nos. 4 and 5. The standard shape of the test specimen for sheared plates shall be as shown by the following sketch:

Test Specimen for Tensile Test.



PIECE TO BE OF SAME THICKNESS AS THE PLATE.

For other material the test specimen may be the same as for sheared plates, or it may be planed or turned parallel throughout its entire length and in all cases where possible, two opposite sides of the test specimens shall be the rolled surfaces. Rivet rounds and small rolled bars shall be tested of full size as rolled.

Number of Tensile Tests.

9. One tensile test specimen shall be taken from the finished material of each melt, but in case this develops flaws, or breaks outside of the middle third of its gauged length, it may be discarded and another test specimen substituted therefor.

Test Specimens for Bending.

10. One test specimen for bending shall be taken from the finished material of each melt as it comes from the rolls, and for material three-fourths inch (3/4") and less in thickness this specimen shall have the natural rolled surface on two opposite sides. The bending test specimen shall be one and one-half inches (1 1/2") wide, if possible, and for material more than three-fourths inch (3/4") thick the bending test specimen may be one-half inch (1/2") thick.

(*g*). The bending test may be made by pressure or by blows.

Annealed Test Specimens.

11. Material which is to be used without annealing or further treatment shall be tested for tensile strength in the condition in which it comes from the rolls. For material which is to be annealed or otherwise treated before use, a full-sized section of tensile test specimen length, shall be similarly treated before cutting the tensile test specimen therefrom.

Yield Point.

12. For the purpose of this specification, the yield point shall be determined by the careful observation of the drop of the beam or halt in the gauge of the testing machine.

Sample for Chemical Analysis.

13. In order to determine if the material conforms to the chemical limitations prescribed in paragraph No. 2 herein, analysis shall be made of drillings taken from a small test ingot.

VARIATION IN WEIGHT.

VARIATION IN WEIGHT.

14. The variation in cross section or weight of more than 2 1/2 per cent. from that specified will be sufficient cause for rejection, except in the case of sheared plates, which will be covered by the following permissible variations :

(*h*) Plates 12 1/2 pounds per square foot or heavier, up to 100 inches wide, when ordered to weight, shall not average more than 2 1-2 per cent. variation above or 2 1-2 per cent. below the theoretical weight. When 100 inches wide and over 5 per cent. above or 5 per cent. below the theoretical weight.

(*i*) Plates under 12 1/2 pounds per square foot, when ordered to weight, shall not average a greater variation than the following :

Plates under 1/4 inch in thickness.

Thickness of plate.	Width of plate.	
	Up to 50 inches.	50 inches and above.
Inch.	Per cent.	Per cent.
1/8 up to 5/32	10	15
5/32 " 3/16	8 1/2	12 1/2
3/16 " 1/4	7	10

FINISH.

15. Finished material must be free from injurious seams, flaws or cracks, and have a workmanlike finish.

BRANDING.

16. Every finished piece of steel shall be stamped with the melt number, and steel for pins shall have the melt number stamped on the ends. Rivets and lacing steel, and small pieces for pin plates and stiffeners, may be shipped in bundles, securely wired together, with the melt number on a metal tag attached.

INSPECTION.

17. The inspector representing the purchaser, shall have all reasonable facilities afforded to him by the manufacturer to satisfy him that the finished material is furnished in accordance with these specifications. All tests and inspections shall be made at the place of manufacture, prior to shipment.

INTERNATIONAL
ASSOCIATION FOR TESTING MATERIALS.

AMERICAN SECTION.

BULLETIN No. 9. MAY, 1900.

PROPOSED STANDARD SPECIFICATIONS
FOR
STRUCTURAL STEEL FOR BUILDINGS.

RECOMMENDED BY AMERICAN BRANCH OF COMMITTEE No. 1, MAY 1, 1900.

There will be a discussion of these specifications at the Third Annual Meeting of the American Section, to be held in New York, on October 25-27, 1900, and you are requested to send in your views by letter, or to be present and take part in the oral discussion.

After the Annual Meeting, Committee No. 1 will consider the points raised, and make any modifications that may be found necessary; and, if so decided at the Annual Meeting, the specifications will be sent to all members of the American Section for approval by letter ballot.

If the other countries perform their work in the same general manner, the final work of the introduction of International Specifications will be reduced to a very simple matter, as there will only be a limited number of specifications to consider instead of hundreds as at the present time.

WM. R. WEBSTER,
Chairman of American Branch of Committee No. 1.

PROCESS OF MANUFACTURE.

1. Steel may be made by either the open-hearth or Bessemer process.

CHEMICAL PROPERTIES.

2. Each of the two classes of structural steel for buildings shall not contain more than 0.10 per cent. of phosphorus.

PHYSICAL PROPERTIES.

Classes.

3. There shall be two classes of structural steel for buildings, namely: RIVET STEEL and MEDIUM STEEL which shall conform to the following physical qualities:

4. **Tensile Tests.**

	Rivet steel.	Medium steel.
Tensile strength, pounds per square inch	50,000 to 60,000	60,000 to 70,000
Yield point, in pounds per square inch shall not be less than	30,000	35,000
Elongation, per cent. in eight inches shall not be less than	26	22

Modifications in elongation for thin and thick material.

5. For material less than five-sixteenths inch (5/16″), and more than three-fourths inch (3/4″) in thickness, the following modifications shall be made in the requirements for elongation:

(*a*). For each increase of one-eighth inch (1/8″) in thickness above three-fourths inch (3/4″), a deduction of one per cent. (1 %) shall be made from the specified elongation.

(*b*). For each decrease of one-sixteenth inch (1/16″) in thickness below five-sixteenths inch (5/16″) a deduction of two and one-half per cent. (2 1/2%) shall be made from the specified elongation.

(*c*). For pins the required elongation shall be five per cent. (5%) less than that specified in paragraph No. 4, as determined on a test specimen the center of which shall be one inch (1″) from the surface.

6. The two classes of structural steel for buildings shall conform to the following bending tests; and for this purpose the test specimen shall be one and one-half inches (1 1/2") wide, if possible, and for all material three-fourths inch (3/4") or less in thickness the test specimen shall be of the same thickness as that of the finished material from which it is cut, but for material more than three-fourths inch (3/4") thick the bending test specimen may be one-half inch (1/2") thick:

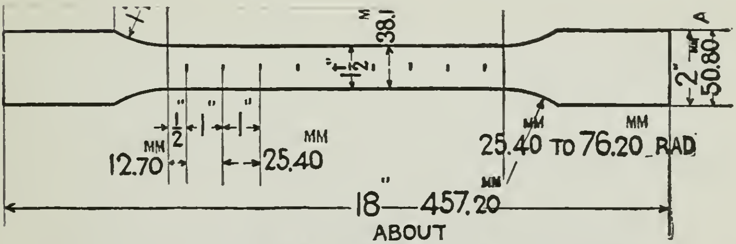
Bending Tests.

Rivet rounds shall be tested of full size as rolled.

(*d*). Rivet steel shall bend cold 180° flat on itself without fracture on the outside of the bent portion.

(*e*). Medium steel shall bend cold 180° around a diameter equal to the thickness of the specimen tested, without fracture on the outside of the bent portion.

TEST PIECES AND METHODS OF TESTING



PIECE TO BE OF SAME THICKNESS AS THE PLATE.

For other material the test specimen may be the same as for sheared plates or it may be planed or turned parallel throughout its entire length and in all cases where possible, two opposite sides of the test specimen shall be the rolled surfaces. Rivet rounds and small rolled bars shall be tested of full size as rolled.

Number of Tensile Tests.

8. One tensile test specimen shall be taken from the finished material of each melt or blow, but in case this develops flaws, or breaks outside of the middle third of its gauged length, it may be discarded and another test specimen substituted therefor.

Test Specimen for Bending.

9. One test specimen for bending shall be taken from the finished material of each melt or blow as it comes from the rolls and for material three-fourths inch (3/4″) and less in thickness this specimen shall have the natural rolled surface on two opposite sides. The bending test specimen shall be one and one-half inches (1 1/2″) wide, if possible, and for material more than three-fourths inch (3/4″) thick the bending test specimen may be one-half inch (1/2″) thick.

Rivet rounds shall be tested of full size as rolled.

(*f*). The bending test may be made by pressure or by blows.

Annealed Test Specimens.

10. Material which is to be used without annealing or further treatment shall be tested for tensile strength in the condition in which it comes from the rolls. For material which is to be annealed or otherwise treated before use, a full-sized section of tensile test specimen length, shall be similarly treated before cutting the tensile test specimen therefrom.

Yield Point.

11. For the purposes of this specification, the yield point shall be determined by the careful observation of the drop of the beam or halt in the gauge of the testing machine.

Sample for Chemical Analysis.

12. In order to determine if the material conforms to the chemical limitations prescribed in paragraph No. 2 herein, analysis shall be made of drillings taken from a small test ingot.

Variation in Weight.

13. The variation in cross section or weight of more than 2 1/2 per cent. from that specified will be sufficient cause for rejection, except in the case of sheared plates, which will be covered by the following permissible variations:

Test Specimen for Bending.

9. One test specimen for bending shall be taken from the finished material of each melt or blow as it comes from the rolls and for material three-fourths inch (3/4″) and less in thickness this specimen shall have the natural rolled surface on two opposite sides. The bending test specimen shall be one and one-half inches (1 1/2″) wide, if possible, and for material more than three-fourths inch (3/4″) thick the bending test specimen may be one-half inch (1/2″) thick. The sheared edges of bending test specimens may be milled or planed.

Annealed Test Specimens.

10. Material which is to be used without annealing or further treatment shall be tested for tensile strength in the condition in which it comes from the rolls. Where it is impracticable to secure a test specimen from material which has been annealed or otherwise treated, a full-sized section of tensile test specimen length, shall be similarly treated before cutting the tensile test specimen therefrom.

(*g*) Plates 12 1/2 pounds per square foot or heavier, up to 100 inches wide, when ordered to weight, shall not average more than 2 1/2 per cent. variation above or 2 1-2 per cent. below the theoretical weight. When 100 inches wide and over 5 per cent. above or 5 per cent. below the theoretical weight.

(*h*) Plates under 12 1/2 pounds per square foot, when ordered to weight, shall not average a greater variation than the following:

Up to 75 inches wide, 2 1/2 per cent. above or 2 1/2 per cent. below the theoretical weight. 75 inches wide up to 100 inches wide, 5 per cent. above or 3 per cent. below the theoretical weight. When 100 inches wide and over 10 per cent. above or 3 per cent. below the theoretical weight.

* * * * * * * * *

(*i*) For all plates ordered to gauge, there will be permitted an average excess of weight over that corresponding to the dimensions on the order equal in amount to that specified in the following table:

TABLE OF ALLOWANCES FOR OVERWEIGHT FOR RECTANGULAR PLATES WHEN ORDERED TO GAUGE.

Plates will be considered up to gauge if measuring not over 1/100 inch less than the ordered gauge.

The weight of 1 cubic inch of rolled steel is assumed to be 0.2833 pound.

(*g*). Plates 12 1/2 pounds per square foot or heavier, when ordered to weight, shall not average more than 2 1/2 per cent. variation above or 2 1/2 per cent. below the theoretical weight.

(*h*). Plates under 12 1/2 pounds per square foot, when ordered to weight, shall not average a greater variation than the following :

Up to 75 inches wide, 2 1/2 per cent. above or 2 1/2 per cent. below the theoretical weight.

75 inches and over, 5 per cent. above or 5 per cent below the theoretical weight.

(*i*). For all plates ordered to gauge, there will be permitted an average excess of weight over that corresponding to the dimensions on the order equal in amount to that specified in the following table :

TABLE OF ALLOWANCES FOR OVERWEIGHT FOR RECTANGULAR PLATES WHEN ORDERED TO GAUGE.

The weight of one cubic inch of rolled steel is assumed to be 0.2833 pound.

Plates 1/4 inch and over in thickness.

Thickness of plate.	Width of plate.		
	Up to 75 inches.	75 to 100 inches.	Over 100 inches.
Inch.	Per cent.	Per cent.	Per cent.
1/4	10	14	18
5/16	8	12	16
3/8	7	10	13
7/16	6	8	10
1/2	5	7	9
9/16	4 1/2	6 1/2	8 1/2
5/8	4	6	8
over 5/8	3 1/2	5	6 1/2

Plates under 1/4 inch in thickness.

Thickness of plate.	Width of plate.	
	Up to 50 inches.	50 inches and above.
Inch.	Per cent.	Per cent.
1/8 up to 5/32	10	15
5/32 " 3/16	8 1/2	12 1/2
3/16 " 1/4	7	10

FINISH.

14. Finished material must be free from injurious seams, flaws or cracks, and have a workmanlike finish.

BRANDING.

15. Every finished piece of steel shall be stamped with the melt or blow number, except that small pieces may be shipped in bundles securely wired together with the melt or blow number on a metal tag attached.

INSPECTION.

16. The inspector representing the purchaser shall have all reasonable facilities afforded to him by the manufacturer to satisfy him that the finished material is furnished in accordance with these specifications. All tests and inspections shall be made at the place of manufacture, prior to shipment.

INTERNATIONAL
ASSOCIATION FOR TESTING MATERIALS.

AMERICAN SECTION.

BULLETIN No. 10. MAY, 1900.

PROPOSED STANDARD SPECIFICATIONS
FOR
OPEN-HEARTH BOILER PLATE AND RIVET STEEL.

Recommended by American Branch of Committee No. 1, May 1, 1900.

There will be a discussion of these specifications at the Third Annual Meeting of the American Section, to be held in New York, on October 25-27, 1900, and you are requested to send in your views by letter, or to be present and take part in the oral discussion.

After the Annual Meeting, Committee No. 1 will consider the points raised, and make any modifications that may be found necessary; and, if so decided at the Annual Meeting, the specifications will be sent to all members of the American Section for approval by letter ballot.

If the other countries perform their work in the same general manner, the final work of the introduction of International Specifications will be reduced to a very simple matter, as there will only be a limited number of specifications to consider instead of hundreds as at the present time.

Wm. R. Webster,
Chairman of American Branch of Committee No. 1.

PROCESS OF MANUFACTURE.

1. Steel shall be made by the open-hearth process.

CHEMICAL PROPERTIES.

2. There shall be three classes of open-hearth boiler plate and rivet steel, namely: FLANGE OR BOILER STEEL, FIRE BOX STEEL and EXTRA SOFT STEEL, which shall conform to the following limits in chemical composition:

	Flange or boiler steel. Per cent.	Fire box steel. Per cent.	Extra soft steel. Per cent.
Phosphorus shall not exceed	0.06	0.04	0.04
Sulphur shall not exceed	0.05	0.04	0.04
Manganese	0.30 to 0.60	0.30 to 0.50	0.30 to 0.50

Boiler Rivet Steel.

3. Steel for boiler rivets shall be of the EXTRA SOFT class as specified in paragraphs Nos. 2 and 4.

PHYSICAL PROPERTIES.

4. The three classes of open-hearth boiler plate and rivet steel, namely: FLANGE OR BOILER STEEL, FIRE BOX STEEL and EXTRA SOFT STEEL, shall conform to the following physical qualities:

Tensile Tests.

	Flange or boiler steel.	Fire box steel.	Extra soft steel.
Tensile strength, pounds per square inch	55,000 to 65,000	52,000 to 62,000	45,000 to 55,000
Yield point in pounds per square inch shall not be less than	33,000	32,000	30,000
Elongation, per cent. in eight inches shall not be less than	25	26	28

Modifications in elongation for thin and thick material.

5. For material less than five-sixteenths inch (5/16″), and more than three-fourths inch (3/4″) in thickness, the following modifications shall be made in the requirements for elongation:

(*a*). For each increase of one-eighth inch (1/8″), in thickness above three-fourths inch (3/4″), a deduction of one per cent. (1%) shall be made from the specified elongation.

2. There shall be three classes of open-hearth boiler plate and rivet steel; namely: FLANGE OR BOILER STEEL, FIRE BOX STEEL and EXTRA SOFT STEEL, which shall conform to the following limits in chemical composition:

	Flange or Boiler steel. Per cent.	Fire box steel. Per cent.	Extra soft steel. Per cent.
Phosphorus shall not exceed...	Acid 0.06 Basic 0.04	Acid 0.04 Basic 0.03	0.04
Sulphur shall not exceed	0.05	0.04	0.04
Manganese	0.30 to 0.60	0.30 to 0.50	0.30 to 0.50

4. The three classes of open-hearth boiler plate and rivet steel, namely: FLANGE OR BOILER STEEL, FIRE BOX STEEL and EXTRA SOFT STEEL, shall conform to the following physical qualities:

Tensile Tests.	Flange or boiler steel.	Fire box steel.	Extra soft steel.
Tensile strength, pounds per square inch	55,000 to 65,000	52,000 to 62,000	45,000 to 55,000
Yield point, in pounds per square inch shall not be less than.........	1/2 T. S.	1/2 T. S.	1/2 T. S.
Elongation, per cent. in eight inches shall not be less than.........	25	26	28

SYNOPSIS OF SPECIFICATIONS FOR BOILER AND FIREBOX STEEL.

COMPILED FOR COMMITTEE No. 1 AMERICAN SECTION, INTERNATIONAL ASSOCIATION FOR TESTING MATERIALS.

BULLETIN No. 10.

Name and date	Grade.	Chemistry.							Physical Requirements.								
		Car. Min	Car Max.	Phos. Max.	Mn. Max	Sil Max.	Sul. Max	Copper Max	Elastic limit lbs. per sq. in.	Tensile strength lbs. per sq. in. Min.	Tensile strength lbs. per sq. in. Max	Elongation, per cent. in 8 in.	Reduction of area, per cent.	Bends: H = Hot. C = Cold. Q = Quench.	Homogeneity test.	Number of tensile tests.	Remarks.
Association, American Steel Mfgrs., 1896	flange or boiler			.06			.04		½	52,000	62,000	25	....	180° flat C., Q	...	Two per melt	
	firebox.			.04			.04		½	52,000	62,000	26	....	" "		"	
Baltimore and Ohio R. R., No. 11a, Dec. 1, 1897 ...	boiler			.05			.04			55,000	65,000	25	....	" " H., C., Q	Yes	One per slab	Either long'l or trans'
	firebox.			.035	.45	.03	.035	.05		53,000	63,000	26	... ..	" "	Yes	Two per slab	One long'l, one trans.
Brooks Locomotive Works.	boiler shell									52,000	60,000	25	50	" " C., Q.		One per plate	
	firebox.	.15	.25	.03	.45	.035	.03			50,000	58,000	26	56	" "	...	"	
Burnham, Williams & Co., Jan. 1, 1895	flange	.15	.25	.05	.45	.03	.05			55,000	65,000	20	...		...	One per slab	
	firebox.	.15	.25	.03	.45	.03	.035										
Canadian Pacific Ry.	boiler					....			..	50,000	65,000	25 in 2 in.	.. .		....	"	
	firebox.			.025	.40	.025	.025			50,000	58,000	28 in 8 in. ⅜ in. t. over 25 in 8 in. under ⅜ in.	.... ..		....	"	
C. C. C. & St. L. Ry., No. 7, May, 1894	boiler							..		55,000	65,000	20		180° flat, C., Q. " " "	...	"	
	firebox	.15	.25	.035	.45	.03	.035	...		55,000	65,000	22 20 in ¾ in. plt.	... .	" " Q.	Yes	"	
Chicago, Burlington & Quincy, No. 1, Sept., 1895	boiler shell	.15	.25	.035	.45	.03	.035	..		55,000	65,000	22	..	" " H., C., Q	Yes		
	fire box.	.15	.25	.035	.45	.03	.035										
Cooke Locomotive Works	boiler and flange firebox	Same as Association American Steel Mfgs.															
Great Northern Ry., No. 16, Oct. 1, 1895		.13	.20	.03	.40	.02	.03	.03		55,000	65,000	23 long'l. 20 trans		180° flat C., Q	Yes	Two per slab.	One long'l, one trans. Plates will not be rejected for high T. S. if elongation is 28% log'l and 25% trans
									.	52,000	60,000	25 l. or t.		" " H., C., Q		One each plate	Plates will not be rejected for high T. S. if elongation is 30% long. and 28% trans.
Hartford Steam Boiler Inspection & Insurance Co.	. .								.	55,000	60,000	25	56				
Heine Safety Boiler Co.	...			.04			.03		32,000	55,000	62,000	25 in ⅝ in. t. over. 22.5 over 7/16 in. in. to ⅝ in. 20 in 7/16 in. or less.		180° flat H., C. up to ½ in. t 180° D. = 1½ t. H., C. o. ½ in. t	Yes.	Three per heat	
L. S. & M. S., Sept. 16, 1897	boiler firebox.									51,000	62,000	25 to 32.		180° flat. H., C.	.....	One each plate	
Missouri Pacific Ry., No. 10, Sept. 22, 1893	boiler	.12	.20	.05	.30 .40	.02	.03			48,000	55,000	24	60	180° flat, Q	Yes	four per slab	
	firebox	.12	.20	.03	.30 .40	.02	.02			48,000	55,000	25	65	" " "	Yes	"	
Norfolk and Western Ry., No. [illegible], Jan. 1, 1895 ...	shell									55,000	67,000	20	..	" " C., Q.	Yes	One per slab	
	firebox	.15	.25	.035	.45	.03	.035			55,000	65,000	22 in 7/16 in. t. over. 20 in ¼ in. t.		" " H., C., Q		"	
Northern Pacific Ry., No. 13, Nov. 1, 1898	boiler shell			.035	.45		.04			57,000	65,000	24		" " "	Yes	One per plate.	
	firebox.	.12	.25	.045	.40	.03	.02			55,000	65,000	26		....		"	
Penna. Railroad Co., No. 1B, Oct. 20, 1896	boiler shell		..	.05						55,000	65,000	1,400,000 ÷ ult.		....		"	Plates will not be rejected for high T. S. if elong. is 28% or over
	firebox	.15	.25	.035	.45	.03	.045	.05		55,000	65,000	1,450,000 ÷ ult.		... .	Yes	"	" " " " " " 30% "
Pgh., Bessemer and Lake Erie.	boiler	.15	.25	.05	.45	.05	.05			52,000	62,000	25		....		One per slab.	
	firebox.	.15	.25	.03	.45	.03	.035										
Pgh. Locomotive Works, Jan. 2, 1891	flange & shell		.22	.05	.35 .50	.015	.015			52,000	62,000	25 in ⅜ in. t. over. 22.5 in 5/16 in. t. 20 in ¼ in.		180° flat, C., Q.	..	"	Fire box plates ¼ in. t. will be accepted with T. S. 60,000 lbs El. 22%.
	firebox.	.12	.20	.035	.35 .50	.01	.035			50,000	58,000	25		" " "		"	
Queen and Crescent Route, No. 1, July 30, 1894	boiler firebox	.15	.25	.035	.45	.03	.045			55,000	65,000	22		" " C.		"	
Richmond Loco. & Mch. Works	boiler	.15	.25	.05	.45	.03	.05			55,000	65,000	24		" " H., C., Q.	Yes.	"	Plts. will not be rejected for high t. s. if elon. is 27% or over } If not caused by cold rolling.
	firebox.	.15	.25	.035	.45	.03	.035			55,000	55,000	23 over ¼ in. thick 22 in ¼ in. t.		" "	Yes	"	" " " " " " 30% "
Schenectady Loco. Works, No. [illegible], Aug. 12, 1895	boiler			.05					..	55,000	55,000	24		" " "		"	
	firebox	.15	.25	.035	.45	.03	.035			55,000	55,000	25		" " "		"	
Southern Pacific Co., No. 27, [illegible] 1897	boiler shell	...								50,000	62,000	26		" " C., Q.			
	firebox			.035	.45		.03			....							
Southern Ry. Co., Dec. 1, 1896	boiler			.05		..			..	55,000	65,000	22 20 in ¼ in. t.		....	....	"	
	firebox.	.15	.25	.035	.45	.03	.035			55,000	65,000	24 in 5/16 in. t. 21 in ¼ in. t.		....	Yes.	"	
Wabash Railroad	boiler	.12	.20	.05	.30 .40	.02	.03			54,000	62,000	24	60	180° flat, Q	Yes	Four per slab.	Compare with Mo. Pacific Ry.
	fire box.	.12	.20	.03	.30 .40	.02	.02			51,000	62,000	25	55	" " "	Yes	"	
White Pass & Yukon Ry 189[illegible]	boiler.									60,000	70,000	20 in 10 in.	...	" " C.	...	One per plate.	
U. S. Marine Law, Jan. 189[illegible]	boiler.			.06			.04		As specified on order.			25 in 2 in. up to ¼ in. 25 in 4 in. over ¼ in. to ⅞ in. 25 in 6 in. over ⅞ in. to 1¾ in.	50 in ½ in. t. and under. 45 over ½ in. to ¾ in. 32.5 over ¾ in. to 1¼ in.	....	....	One per slab.	
Mexican Central Ry., Oct. 2, 189[illegible]	boiler firebox	Same as Penna. R. R. to															

(*b*). For each decrease of one-sixteenth inch (1/16″) in thickness below five-sixteenths inch (5/16″) a deduction of two and one-half per cent. (2 1/2%) shall be made from the specified elongation.

Bending Tests.

6. The three classes of open-hearth boiler plate and rivet steel shall conform to the following bending tests; and for this purpose the test specimen shall be one and one-half inches (1 1/2″) wide if possible, and for all material three-fourths inch (3/4″) or less in thickness the test specimen shall be of the same thickness as that of the finished material from which it is cut; but for material more than three-fourths inch (3/4″) thick, the bending test specimen may be one-half inch (1/2″) thick:

Rivet rounds shall be tested of full size as rolled.

(*c*). Test specimens cut from the rolled material as specified above, shall be subjected to a cold bending test, and also to a quenched bending test. The cold bending test shall be made on the material in the condition in which it is to be used, and prior to the quenched bending test, the specimen shall be heated to a light cherry-red as seen in the dark and quenched in water, the temperature of which is between 80° and 90° Fahrenheit.

(*d*). Flange or boiler steel, fire box steel and rivet steel, both before and after quenching, shall bend cold one hundred and eighty degrees (180°) flat on itself without fracture on the outside of the bent portion.

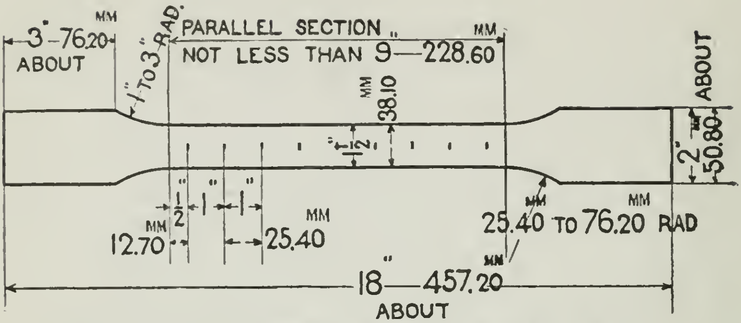
Homogeneity Tests.

7. For fire box steel a sample taken from a broken tensile test specimen, shall not show any single seam or cavity more than one-fourth inch (1/4″) long in either of the three fractures obtained on the test for homogeneity as described below in paragraph 12.

TEST PIECES AND METHODS OF TESTING.

Test Specimen for Tensile Test.

8. The standard test specimen of eight inch (8″) gauged length, shall be used to determine the physical properties specified in paragraphs Nos. 4 and 5. The standard shape of the test specimen for sheared plates shall be as shown by the following sketch:



PIECE TO BE OF SAME THICKNESS AS THE PLATE.

For other material the test specimen may be the same as for sheared plates, or it may be planed or turned parallel throughout its entire length and in all cases where possible, two opposite sides of the test specimens shall be the rolled surfaces. Rivet rounds and small rolled bars shall be tested of full size as rolled.

Number of Tensile Tests.

9. One tensile test specimen will be furnished from each plate as it is rolled, and two tensile test specimens will be furnished from each melt of rivet rounds. In case any one of these develops flaws or breaks outside of the middle third of its gauged length, it may be discarded and another test specimen substituted therefor.

Test Specimens for Bending.

10. For material three-fourths inch (3/4") or less in thickness, the bending test specimen shall have the natural rolled surfaces on two opposite sides. The bending test specimens cut from plates shall be one and one-half inches (1 1/2") wide and for material more than three-fourths inch (3/4") thick the bending test specimens may be one-half inch (1/2") thick. The bending test specimens for rivet rounds shall be of full size as rolled. The bending test may be made by pressure or by blows.

Number of Bending Tests.

11. One cold bending specimen and one quenched bending specimen will be furnished from each plate as it is rolled. Two cold bending specimens and two quenched bending specimens will be furnished from each melt of rivet rounds. The homogeneity test for fire box steel shall be made on one of the broken tensile test specimens.

Test Specimens for Bending.

10. For material three-fourths inch (3/4″) or less in thickness, the bending test specimen shall have the natural rolled surface on two opposite sides. The bending test specimens cut from plates shall be one and one-half inches (1 1/2″) wide and for material more than three-fourths inch (3/4″) thick the bending test specimens may be one-half inch (1/2″) thick. The sheared edges of bending test specimens may be milled or planed. The bending test specimens for rivet rounds shall be of full size as rolled. The bending test may be made by pressure or by blows.

Homogeneity Tests for Fire Box Steel.

12. The homogeneity test for fire box steel is made as follows: A portion of the broken tensile test specimen is either nicked with a chisel or grooved on a machine, transversely about a sixteenth of an inch (1/16″) deep, in three places about two inches (2″) apart. The first groove should be made on one side, two inches (2″) from the square end of the specimen; the second, two inches (2″) from it on the opposite side; and the third, two inches (2″) from the last, and on the opposite side from it. The test specimen is then put in a vise, with the first groove about a quarter of an inch (1/4″) above the jaws, care being taken to hold it firmly. The projecting end of the test specimen is then broken off by means of a hammer, a number of light blows being used, and the bending being away from the groove. The specimen is broken at the other two grooves in the same way. The object of this treatment is to open and render visible to the eye any seams due to failure to weld up, or to foreign interposed matter, or cavities due to gas bubbles in the ingot. After rupture, one side of each fracture is examined, a pocket lens being used if necessary, and the length of the seams and cavities is determined.

Yield Point

13. For the purposes of this specification, the yield point shall be determined by the careful observation of the drop of the beam or halt in the gauge of the testing machine.

Sample for Chemical Analysis.

14. In order to determine if the material conforms to the chemical limitations prescribed in paragraph No. 2 herein, analysis shall be made of drillings taken from a small test ingot. An additional check analysis may be made from a tensile specimen of each melt used on an order, other than in locomotive fire-box steel. In the case of locomotive fire-box steel a check analysis may be made from the tensile specimen from each plate as rolled.

VARIATION IN WEIGHT.

15. The variation in cross section or weight of more than 2 1/2 per cent. from that specified will be sufficient cause for rejection, except in the case of sheared plates, which will be covered by the following permissible variations:

(*e*). Plates 12 1/2 pounds per square foot or heavier, when ordered to weight, shall not average more than 2 1/2 per cent. variation above, or 2 1/2 per cent. below the theoretical weight.

(*f*). Plates under 12 1/2 pounds per square foot, when ordered to weight, shall not average a greater variation than the following:

Up to 75 inches wide, 2 1/2 per cent. above or 2 1/2 per cent. below the theoretical weight.

75 inches and over, 5 per cent. above or 5 per cent. below the theoretical weight.

(*g*). For all plates ordered to gauge, there will be permitted an average excess of weight over that corresponding to the dimensions on the order equal in amount to that specified in the following table:

TABLE OF ALLOWANCES FOR OVERWEIGHT FOR RECTANGULAR PLATES WHEN ORDERED TO GAUGE.

The weight of 1 cubic inch of rolled steel is assumed to be 0.2833 pound.

Plates 1/4 inch and over in thickness.

	Width of plate.		
Thickness of plate. Inch.	Up to 75 inches. Per cent.	75 to 100 inches. Per cent.	Over 100 inches. Per cent.
1/4	10	14	18
5/16	8	12	16
3/8	7	10	13
7/16	6	8	10
1/2	5	7	9
9/16	4 1/2	6 1/2	8 1/2
5/8	4	6	8
Over 5/8	3 1/2	5	6 1/2

Plates under 1/4 inch in thickness.

	Width of plate.	
Thickness of plate. Inch.	Up to 50 inches. Per cent.	50 inches and above. Per cent.
1/8 up to 5/32	10	15
5/32 " 3/16	8 1/2	12 1/2
3/16 " 1/4	7	10

FINISH.

16. All finished material shall be free from injurious surface defects and laminations, and must have a workmanlike finish.

(*e*) Plates 12 1/2 pounds per square foot or heavier, up to 100 inches wide, when ordered to weight, shall not average more than 2 1/2 per cent. variation above or 2 1/2 per cent. below the theoretical weight. When 100 inches wide and over 5 per cent. above or 5 per cent. below the theoretical weight.

(*f*) Plates under 12 1/2 pounds per square foot, when ordered to weight, shall not average a greater variation than the following:

Up to 75 inches wide, 2 1/2 per cent. above or 2 1/2 per cent. below the theoretical weight. 75 inches wide up to 100 inches wide, 5 per cent. above or 3 per cent. below the theoretical weight. When 100 inches wide and over 10 per cent. above or 3 per cent. below the theoretical weight.

* * * * * * * * *

(*g*) For all plates ordered to gauge, there will be permitted an average excess of weight over that corresponding to the dimensions on the order equal in amount to that specified in the following table:

TABLE OF ALLOWANCES FOR OVERWEIGHT FOR RECTANGULAR PLATES WHEN ORDERED TO GAUGE.

Plates will be considered up to gauge if measuring not over 1/100 inch less than the ordered gauge.

The weight of 1 cubic inch of rolled steel is assumed to be 0.2833 pound.

Branding.

17. Every finished piece of steel shall be stamped with the melt number, and each plate, and the coupon or test specimen cut from it, shall be stamped with a separate identifying mark or number. Rivet steel may be shipped in bundles securely wired together with the melt number on a metal tag attached.

Inspection.

18. The inspector representing the purchaser, shall have all reasonable facilities afforded to him by the manufacturer to satisfy him that the finished material is furnished in accordance with these specifications. All tests and inspections shall be made at the place of manufacture, prior to shipment.

INTERNATIONAL
ASSOCIATION FOR TESTING MATERIALS.

AMERICAN SECTION.

BULLETIN No. 11. MAY, 1900.

PROPOSED STANDARD SPECIFICATIONS
FOR
STEEL RAILS.

RECOMMENDED BY AMERICAN BRANCH OF COMMITTEE NO. 1, MAY 1, 1900.

There will be a discussion of these specifications at the Third Annual Meeting of the American Section, to be held in New York, on October 25-27, 1900, and you are requested to send in your views by letter, or to be present and take part in the oral discussion.

After the Annual Meeting, Committee No. 1 will consider the points raised, and make any modifications that may be found necessary; and, if so decided at the Annual Meeting, the specifications will be sent to all members of the American Section for approval by letter ballot.

If the other countries perform their work in the same general manner, the final work of the introduction of International Specifications will be reduced to a very simple matter, as there will only be a limited number of specifications to consider instead of hundreds as at the present time.

WM. R. WEBSTER,
Chairman of American Branch of Committee No. 1.

Process of Manufacture.

1. (*a*). Steel may be made by the Bessemer or open-hearth process.

(*b*). The entire process of manufacture and testing shall be in accordance with the best standard current practice, and special care shall be taken to conform to the following instructions.

(*c*). Ingots shall be kept in a vertical position in pit heating furnaces.

(*d*). No bled ingots shall be used.

(*e*). Sufficient material shall be discarded from the top of the ingots to insure sound rails.

Chemical Properties.

2. Rails of the various weights per yard specified below shall conform to the following limits in chemical composition :

	50 to 59 + pounds. Per cent.	60 to 69 + pounds. Per cent.	70 to 79 + pounds. Per cent.	80 to 89 + pounds. Per cent.	90 to 100 pounds. Per cent.
Carbon ·········	0.35–0.45	0.38–0.48	0.40–0.50	0.43–0.53	0.45–0.55
Phosphorus shall not exceed ··	0.10	0.10	0.10	0.10	0.10
Silicon shall not exceed ·····	0.20	0.20	0.20	0.20	0.20
Manganese ······	0.70–1.00	0.70–1.00	0.75–1.05	0.80–1.10	0.80–1.10

Physical Properties.

Drop Test.

3. One drop test shall be made on a piece of rail not more than six feet long, selected from every fifth blow of steel. The rail shall be placed head upwards on the supports and the various sections shall be subjected to the following impact tests.

	Weight of rail. Pounds per yard.			Height of drop. Feet.
	45	to and including	55	15
More than	55	"	65	16
"	65	"	75	17
"	75	"	85	18
"	85	"	100	19

If any rail break when subjected to the drop test, two addi-

SYNOPSIS OF AMERICAN RAIL SPECIFICATIONS.

COMPILED FOR COMMITTEE No. 1.—AMERICAN SECTION, INTERNATIONAL ASSOCIATION FOR TESTING MATERIALS, JANUARY, 1900.

Name and date.	W'ght of rail.	Manner of selecting test piece for analysis.	Chemistry.											Physical tests.								Length.				Heights.		Seconds accepted.	Variation in weight allowed, %.	Branding.
			Carbon.			Manganese		Silicon.		Sulphur.		Ph'sphorus		Drop.				Bending.				Length, feet.	Short rails.		Var. in length, inches.	Over, ins	Under, ins			
			Desired.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	W'ght. Lbs.	Weight of drop, feet.	Distance between supports	Remarks.	Test Ingots.	Size of test bar.	Bend.	Remarks.		Lengths accepted.	Per cent. of order						
The Carnegie Steel Company Limited, Jan. 1, 1899	50 to 60 60 to 70 70 to 80 80 to 90 90 to 100			.35 .38 .40 .43 .45	.45 .48 .50 .53 .55	.70 .70 .75 .80 .80	1.00 1.00 1.05 1.10 1.10	..	.20				.10			....	..	......	......		...	30	Varying by even feet down to 24	10	± 1/4	1/32	1/64	Specified in order	½ for entire order.	Name of maker, month and year rolled in raised letters on side of web. Heat number shall be stamped on each rail.
Robert W. Hunt, West of Allegheny Mountains, Oct., 1895	70 75 80 90 100			.43 .45 .48 .55 .62	.51 .53 .56 .63 .70	Left to mak'ers.		.10					.085	2,000	Up to and including 70 lb. rail, 16 ft. All heavier rails, 20 ft.	3 ft. 0 in. 4 ft. 0 in.	Rail butt from each conversion for tests if first fails a second to be made, failure of second rejects heat, but if second stands a third must stand to accept heat. Solid supports.	Two test ingots 3 in. × 3 in. × 4 in., one from steel in first regular ingot and second from metal in last ingot.	Bar at least ¼ in. square shall be drawn at one heat by hammering.	90° by blows of a sledge	Should one bar from heat fail, a third bar may be taken from blow rolled from ingot represented by failed one; if this stands it may be accepted in lieu of failed one.	30 at 60° F	Specified in order	10	± 1/4	1/32	1/64	Specified in order	....	Number of charge, name of maker, month and year on side of web in such position as not to be covered by splice bar
Wm. R. Webster, 1899	60	.... ..	.40	.35	.45	..	.90	..	...		.05		.10	2,000	16 ft. 0 in.	3 ft. 0 in.	One piece 6 ft. long from each blow for test, if first fails two more will be made from same blow, and if either of these fail blow will be rejected	......	....		......	30	28, 26, 24, 21, 18	10 As noted in order	± 1/4	1/32	1/64		1 for individual rail ½ for whole order. weigh 1 rail per hour.	Maker's name, month and year, railroad's symbol rolled on web; blow number to be stamped on web.
Pennsylvania R. R., April, 188[illegible]		A test bar ¾ in. wide and about 10 in. long to be taken from web of rail of each charge.	.	.30	.50	...	.	....	..					...	...	...	......	......	...		......	30 at 60° F	When mentioned in contract 27½, 25	10			....	When mentioned in contract 5	. .	Number of charge, year and place of m'nufacture plainly marked on side of web
Cambria [illegible] Jan. 1899 ...			.	.40	.60	.	.	...	.				.10	.	...	...	......	Two test ingots from middle portion of ingot from each melt while being bloomed	Forged down to ½ in. square bar at one heat	90° by blows of a sledge	Should one test piece from heat fail second one shall be prepared; if this fails the heat will be rejected.	30	Even down to 24	10	± 1/4	1/32	1/64	...		Name of maker, month and year rolled on side of web; heat number to be stamped on each rail.
Wabash R. R., Mar. 1, 1896	70 75 80			.43 .45 .48	.51 .53 .56	Left to mak'ers.		.10					.085	...	Physical tests same as R. W. Hunt's			.....	.. ..	.	......	30 at 70° F.	Varying by even feet down to 25	10	± 1/4	1/64	1/64	Specified in order.	... ...	Same as R. W. Hunt's
Louisville & Nashville Railroad, 18[illegible]	56½ 70 80			.42 .47 .55	.52 .57 .65	.		.15	.20		.07		.085	2,000	16 ft. 0 in. 20 ft. 0 in. 24 ft. 0 in.	3 ft. 0 in.	Without bending more than 6 in. and same piece reversed to stand without breaking, a centre blow on convex side of same weight falling one half distance	....			. .... .	33 at 60° F	30, 27 and 24	10 of each month's delivery.	± 1/4		..	5 of each month's delivery	1 for individual rails, ½ whole month's delivery.	Place and date of manufacture to be rolled on side of web; charge number to be stamped.
Michigan Central Railroad, 1896	80	..	.	.45	.55	.85	1.15	.10	.20		.07		.09	2,000	20 ft. 0 in.	3 ft. 0 in.	One rail butt each heat; if heat exceeds 9 tons two tests may be taken; broken pieces must show 4% elongation in inch under greatest tension, if rail fails to show 4%, second must be tested, failure of second rejects heat, 90% of tests must stand without breaking.	From each heat two test ingots 2½ in. × 2½ in. × 4 in., one from metal from first ingot, other from metal from final ingot	Either one or both test ingots may be hammered into bar ½ in. square 18 in. or 20 in. long	90° by blows of a sledge	. . ..	30 at 70° F	28, 26 and 24	10	± 1/4	1/64 as rolling proceeds	1/64 when rolls are new	3 of whole order	.. ...	Name of maker, month and year with designation of rail rolled on side of web; heat number stamped on side of web, so as not to be covered by splice bar
Queen & Crescent, 1897. Cincinnati, New Orleans & Texas Pacific Railway, 1898.	75	.....	..	.42	.47	.....	....	..	..	Metal from which steel is made	.05	..	.10		....	. . ....	......	Bending tests same as R. W. Hunt's		.. .	. . ....	30 at 60° F	26 and [illegible]	10	± 1/4	1/32	1/64	....	.. . .	Name of maker, month and year to be rolled on side of web; charge number to be stamped on web.
Northern Pacific Ry., Jan. 20, '97		....	.	.50	.60	...	1.00	.10	.		.05		.08	...	Physical tests same as R. W. Hunt's.			....	....	. . ..	. .. . .	30 at 60° F	28, 26, 24	10	± 1/4	1/32	1/64	5	... .	Same as R. W. Hunt's
Norfolk & Western Railway, Jan. [illegible]	85	A test bar ¾ in. wide and about 10 in. long to be taken from web of rail of each charge	.	.55	.63	.90	1.10	.10	.14		.04		.085	2,000	Drop test if required		. ...	Bending tests same as R. W. Hunt's		.	. . ..	30 at 60° F	28, 2[illegible]	10	± 1/4	... ...		.....	. ...	
Chicago, Burlington & Quincy R. R. [illegible]	65 75	. . ...	.	.45 .50	.	Left to makers		.10	..	Left to makers			.085	2,000	16 ft. 0 in.	3 ft. 0 in. 4 ft. 0 in.	One rail end corresponding to ingot top; each heat for test if first fail second to be made; failure of second rejects heat but if second stands a third must stand to accept heat	....	..... .		. ...	30 at 60° F	Down to 24 average shall not fall below 2[illegible]	5	± 1/4	1/32	1/64	. .	.	Same as R. W. Hunt's
Illinois Central, March 1896	70 75	.	.	.45	.55	Left to makers		.10		Left to makers		..	.075	2,000	16 ft. 0 in. 18 ft. 0 in.	3 ft. 0 in. 4 ft. 0 in.	Same as C., B. & Q.	Bending tests same as R. W. Hunt's		.	.. .. .	30 at 60° F	28, 26, 24	10	± 1/4	1/32	1/64		..	Same as R. W. Hunt's
Southern Pacific, Tables, Nov., 1897, 90 lbs., Jan. 1, 1899	75 90	East of Alleghenies West of Alleghenies East of Alleghenies West of Alleghenies	.53 .50 .63 .60	.48 .45 .58 .55	.58 .55 .68 .65	.80 .80 .80 .80	1.00 1.00 1.00 1.00	.10 .10 .10 .10	.15 .15 .15 .15		.07 .05 .07 .05		.06 .085 .06 .085	2,000	16 ft. 0 in. 20 ft. 0 in.	3 ft. 0 in. 4 ft. 0 in.	If two rail butts out of three stand test melt will be accepted.	....	. ...	.	. . .	30 at 60° F	28, 26, 24, 22	10	± 1/4	1/32	1/64		...	
Southern Ry., March 8, 1898.	75 80	....		.40	.50	......	....	...			.05		.10	2,000	20 ft. 0 in.	3 ft. 0 in.	The failure of two out of three to stand one blow from this height will reject all rails from that melt.	Two test ingots 3 in. × 3 in. × 4 in., one from first and other from last portion of pour	Bar ½ in. square drawn by hammering at one heat.	90°	Should one bar fail, another will be taken from same ingot in lieu of failed bar	30 at 60° F.	29, [illegible] 27, [illegible]	6 4	± 1/4	1/32	1/32	......	½	Maker's name, month and year rolled on web, melt number to be stamped on web.

[illegible] for 19 roads, including the following, made to Pennsylvania Railroad Specifications: Pennsylvania Company Lines and Branches; Allegheny Valley; Cincinnati, Indianapolis, St. Louis & Chicago; Columbus, Hocking Valley & Toledo; Evansville & Terre Haute; Fort Wayne & Eastern; Indianapolis Union; Pittsburg, Painsville & Fairport; Pittsburg & Eastern; Richmond, Fredericksburg & Potomac; Terre Haute & Indianapolis.

[illegible] for 1[illegible] roads and their branches, including the following, to manufacturer's specifications: Atlantic Coast Line, Atchison, Topeka & Santa Fe; Baltimore & Ohio; Baltimore & Ohio Southwestern; Chesapeake & Ohio; C., C., C. & St. L. Ry.; Canadian Pacific; Central Vermont; Chicago, Milwaukee & St. Paul; Denver & Rio Grande; Erie Railroad; Flint & Pere Marquette; Grand Trunk; Great Northern, Grand Rapids & Indiana, Illinois Central; Lehigh Valley, Lake Shore & Michigan Southern, Missouri Pacific, Mexican Central, New York, Chicago & St. Louis; New York Central & Hudson River; Oregon Short Line, Pittsburg & Western; Pittsburg & Lake Erie; Pittsburg, Bessemer & Lake Erie, Southern Railway, Texas Pacific; Union Pacific; Wabash

tional tests will be made of other rails from the same blow of steel, and if either of these latter tests fail all the rails of the blow which they represent will be rejected, but if both of these additional test pieces meet the requirements, all the rails of the blow which they represent will be accepted. If the rails from the tested blow shall be rejected for failure to meet the requirements of the drop test as above specified, two other rails will be subjected to the same tests, one from the blow next preceding, and one from the blow next succeeding the rejected blow. In case the first test taken from the preceding or succeeding blow shall fail, two additional tests shall be taken from the same blow of steel, the acceptance or rejection of which shall also be determined as specified above, and if the rails of the preceding or succeeding blow shall be rejected, similar tests may be taken from the previous or following blows, as the case may be, until the entire group of five blows is tested, if necessary.

The acceptance or rejection of all the rails from any blow will depend upon the result of the tests thereof.

Test Pieces and Methods of Testing.

Drop Testing Machine.

4. The drop test machine shall have a tup of two thousand (2000) pounds weight, the striking face of which shall have a radius of not more than five inches (5″), and the test rail shall be placed head upwards on solid supports three feet (3′) apart. The anvil block shall weigh at least twenty thousand (20,000) pounds, and the supports shall be a part of, or firmly secured to, the anvil.

Sample for Chemical Analysis.

5. The manufacturer shall furnish the inspector, daily, with carbon determinations of each blow, and a complete chemical analysis every twenty-four hours, representing the average of the other elements contained in the steel. These analyses shall be made on drillings taken from a small test ingot.

Finish.

Section.

6. Unless otherwise specified, the section of rail shall be the American Standard, recommended by the American Society of Civil Engineers, and shall conform, as accurately as possible, to the templet furnished by the railroad

company, consistent with paragraph No. 7, relative to specified weight. A variation in height of one sixty-fourth of an inch (1/64″) less and one thirty-second of an inch (1/32″) greater than the specified height will be permitted. A perfect fit of the splice bars, however, shall be maintained at all times.

Weight. 7. The weight of the rails shall be maintained as nearly as possible after complying with paragraph No. 6, to that specified in contract. A variation of one-half of one per cent. (1/2%) for an entire order will be allowed. Rails shall be accepted and paid for according to actual weights.

Length. 8. The standard length of rails shall be thirty feet (30′). Ten per cent. (10%) of the entire order will be accepted in shorter lengths, varying by even feet down to twenty-four feet (24′). A variation of one-fourth of an inch (1/4″) in length from that specified will be allowed.

Drilling. 9. Circular holes for splice bars shall be drilled in accordance with the specifications of the purchaser. The holes shall accurately conform to the drawing and dimensions furnished in every respect, and must be free from burrs.

Finish. 10. Rails shall be straightened while cold, smooth on head, sawed square at ends, and, prior to shipment, shall have the burr, occasioned by the saw cutting, removed, and the ends made clean. Number 1 rails shall be free from injurious defects and flaws of all kinds.

BRANDING.

11. The name of the maker, the month and year of manufacture, shall be rolled in raised letters on the side of the web, and the number of the blow shall be stamped on each rail.

INSPECTION.

12. The inspector representing the purchaser shall have all reasonable facilities afforded to him by the manufacturer to satisfy him that the finished material is furnished in accordance with these specifications. All tests and inspections shall be made at the place of manufacture, prior to shipment.

No. 2 Rails.

13. Rails that possess any injurious physical defects, or which for any other cause are not suitable for first quality, or number 1 rails, shall be considered as number 2 rails, provided, however, that rails which contain any physical defects which seriously impair their strength shall be rejected. The ends of all number 2 rails shall be painted in order to distinguish them.

INTERNATIONAL
ASSOCIATION FOR TESTING MATERIALS.

AMERICAN SECTION.

BULLETIN No. 12. MAY, 1900.

PROPOSED STANDARD SPECIFICATIONS
FOR
STEEL SPLICE BARS.

RECOMMENDED BY AMERICAN BRANCH OF COMMITTEE NO. 1, MAY 1, 1900.

There will be a discussion of these specifications at the Third Annual Meeting of the American Section, to be held in New York, on October 25-27, 1900, and you are requested to send in your views by letter, or to be present and take part in the oral discussion.

After the Annual Meeting, Committee No. 1 will consider the points raised, and make any modifications that may be found necessary; and, if so decided at the Annual Meeting, the specifications will be sent to all members of the American Section for approval by letter ballot.

If the other countries perform their work in the same general manner, the final work of the introduction of International Specifications will be reduced to a very simple matter, as there will only be a limited number of specifications to consider instead of hundreds as at the present time.

WM. R. WEBSTER,
Chairman of American Branch of Committee No. 1.

PROCESS OF MANUFACTURE.

1. Steel for splice bars may be made by the Bessemer or open-hearth process.

CHEMICAL PROPERTIES.

2. Steel for splice bars shall conform to the following limits in chemical composition:

	Per cent.
Carbon shall not exceed	0.15
Phosphorus shall not exceed	0.10
Manganese	0.30 to 0.60

PHYSICAL PROPERTIES.

Tensile Tests.

3. Splice bar steel shall conform to the following physical qualities: —

Tensile strength, pounds per square inch	54,000 to 64,000
Yield point, pounds per square inch	32,000
Elongation, per cent. in eight inches shall not be less than	25

Bending Tests.

4. (*a*) A test specimen cut from the head of the splice bar shall bend 180° flat on itself without fracture on the outside of the bent portion

(*b*) If preferred the bending tests may be made on an unpunched splice bar, which, if necessary, shall be first flattened, and shall then be bent 180° flat on itself without fracture on the outside of the bent portion.

TEST PIECES AND METHODS OF TESTING.

Test Specimen for Tensile Test

5. A test specimen of eight inch (8″) gauged length, cut from the head of the splice bar, shall be used to determine the physical properties specified in paragraph No. 3.

Number of Tensile Tests.

6. One tensile test specimen shall be taken from the rolled splice bars of each blow or melt, but in case this develops flaws, or breaks outside of the middle third of its gauged length, it may be discarded and another test specimen substituted therefor.

SYNOPSIS OF SPECIFICATIONS FOR STEEL SPLICE BARS.

COMPILED FOR COMMITTEE NO. 1.—AMERICAN SECTION INTERNATIONAL ASSOCIATION FOR TESTING MATERIALS.—JAN., 1900.

BULLETIN NO. 12.

andidate.	Kind of Material.	Chemistry			Physical Tests.					Test Piece.	Branding.
		Carbon Max.	Phos Max.	Mang.	Ultimate Strength lbs. per sq. in.	Elastic Limit lbs. per sq. in.	Elongation per cent.	Reduction of area.	Bend Test.		
gie Steel Co. Jan 1, 1899	Not Specified	.15	10	.40 .60	54,000 to 61,000.	½ ult.	25 in 8. in.		180° flat	Cut from bend of splice bar	Name of maker and year rolled in raised letters on side of bar.
Hunt, 1890.....	Pneumatic or Open Hearth.	.17 If Phos. exceeds 10, Carbon should not exceed 12. Phos. should not exceed 12.	10								
bster, 1899	Bessemer	.15	10	Sul. 06	Not over 64,000.		25 in 8 in.		Full size bar to bend flat cold without fracture.		Initials of maker and year to be rolled on bars.
nia Railroad, 1898	Bessemer or Open Hearth.	08 to 12	.08		54,000 to 64,000.	½ ult.	20 in 8 in.	40.	180° flat.	Test piece 14 in. long with uniform section ½ inch square. Cut from finished mail.	Number and such other marks as required by railroad Co. to be rolled on each bar as shown on drawing.
nd Nashville			085	Sul. 07	55,000 to 65,000.	Bolt hole to stand drifting 25 per cent.			180° θ = 1½ × t.	Sample ¾ in dia., length between jaws of testing machine equal to 12 diameters.	
Qu rescent, Feb.		Same as R. W. Hunt's.									
N cific Railway,		Same as R. W. Hunt's									
and Western , Jan., 1899	Soft Bessemer.	10			57,000.	½ ult.	25 in 8 in.	..	180° flat.	2 Tests 1½ in. wide. Cut from angle bar from each blow.	
Co., April, 1897..			08		56,000 to 64,000.	½ ult.	25	180°θ=t			
ia and Reading er 2, 1898					Not less than 48,000	.	25 in 2. in.	90°θ t			
, July 1, 1899	....				52,000 to 62,000.	...	25 in 8. in.		Bar must bend 180° in. flat.		

10. All splice bars shall be smoothly rolled and true to templet. The bars shall be sheared accurately to length and free from fins or cracks, and shall perfectly fit the rails for which they are intended. The punching and notching shall accurately conform in every respect to the drawing and dimensions furnished. A variation in weight of more than 2 1/2 per cent. from that specified will be sufficient cause for rejection.

7. One test specimen cut from the head of the splice bar shall be taken from a rolled bar of each blow or melt, or if preferred the bending test may be made on an unpunched splice bar, which, if necessary, shall be flattened before testing. The bending test may be made by pressure or by blows.

Test Specimen for Bending.

8. For the purposes of this specification, the yield point shall be determined by the careful observation of the drop of the beam or halt in the gauge of the testing machine.

Yield Point.

9. In order to determine if the material conforms to the chemical limitations prescribed in paragraph No. 2 herein, analysis shall be made of drillings taken from a small test ingot.

Sample for Chemical Analysis.

FINISH.

10. All splice bars shall be smoothly rolled and true to templet. The bars shall be sheared accurately to length and free from fins or cracks, and shall perfectly fit the rails for which they are intended. The punching and notching shall accurately conform in every respect to the drawing and dimensions furnished.

BRANDING.

11. The name of the maker and the year of manufacture shall be rolled in raised letters on the side of the splice bar.

INSPECTION.

12. The inspector representing the purchaser, shall have all reasonable facilities afforded to him by the manufacturer, to satisfy him that the finished material is furnished in accordance with these specifications. All tests and inspections shall be made at the place of manufacture, prior to shipment.

INTERNATIONAL

ASSOCIATION FOR TESTING MATERIALS.

AMERICAN SECTION.

BULLETIN No. 13. MAY, 1900.

PROPOSED STANDARD SPECIFICATIONS
FOR
STEEL AXLES.

RECOMMENDED BY AMERICAN BRANCH OF COMMITTEE NO. 1, MAY 1, 1900.

There will be a discussion of these specifications at the Third Annual Meeting of the American Section, to be held in New York, on October 25-27, 1900, and you are requested to send in your views by letter, or to be present and take part in the oral discussion.

After the Annual Meeting, Committee No. 1 will consider the points raised, and make any modifications that may be found necessary; and, if so decided at the Annual Meeting, the specifications will be sent to all members of the American Section for approval by letter ballot.

If the other countries perform their work in the same general manner, the final work of the introduction of International Specifications will be reduced to a very simple matter, as there will only be a limited number of specifications to consider instead of hundreds as at the present time.

WM. R. WEBSTER,
Chairman of American Branch of Committee No. 1.

PROCESS OF MANUFACTURE.

1. Steel for axles shall be made by the open-hearth process.

CHEMICAL PROPERTIES.

2. There will be three classes of steel axles which shall conform to the following limits in chemical composition.

	Car, engine truck and tender truck axles. Per cent.	Driving wheel axles. (Carbon steel.) Per cent.	Driving wheel axles. (Nickel steel.) Per cent.
Phosphorus shall not exceed.....	0.06	0.06	0.04
Sulphur " " "	0.06	0.06	0.04
Nickel " " "	....	....	3.75

PHYSICAL PROPERTIES.

Tensile Tests.

3. For car, engine truck, and tender truck axles no tensile test shall be required.

4. The minimum physical qualities required in the two classes of driving wheel axles shall be as follows:

	Driving wheel axles. (Carbon steel.)	Driving wheel axles. (Nickel steel.)
Tensile strength, pounds per square inch.	80,000	80,000
Yield point, pounds per square inch......	40,000	50,000
Elongation, per cent. in two inches......	18	25
Contraction of area per cent.............	..	45

Drop Test.

5. One axle selected from each melt, when tested by the drop test described in paragraph No. 9, shall stand the number of blows at the height specified in the following table without rupture and without exceeding, as the result of the first blow, the deflection given. Any melt failing to meet these requirements will be rejected.

Diameter of axle at center. Inches.	Number of blows.	Height of drop. Feet.	Deflection. Inches.
4 1/4	5	24	8 1/4
4 3/8	5	26	8 1/4
4 7/16	5	28 1/2	8 1/4
4 5/8	5	31	8
4 3/4	5	34	8
5 3/8	5	43	7
5 7/8	7	43	5 1/2

SYNOPSIS OF SPECIFICATIONS FOR RAILROAD AXLES

[illegible] FOR COMMITTEE No. 3, AMERICAN SECTION OF THE INTERNATIONAL ASSOCIATION [illegible] TESTING MATERIALS

Name	Test piece	Diameter at center, inches	Weight of drop, pounds	Height of drop, feet	Distance between supports, feet	Number of blows	Desired deflection, inches	Maximum deflection, inches	[illegible]	[illegible]	Brand	[illegible]	Finish	[illegible]
[illegible]	Test piece 6 in. long cut from test axle. Borings for analysis will be taken by [illegible] in. drill [illegible] parallel to axis of axle at a point on radial line [illegible] of distance from center to circumference	[illegible]	1,640	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Drop machine to have [illegible] as described in specifications. Axle must be turned over after first and third and when required after fifth blow	[illegible] print sent with [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Ditto	[illegible]	1,640	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Ditto	[illegible]	[illegible]	Ditto	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	1,640	23	[illegible]	[illegible]	[illegible]	[illegible]	Firm supports. Axle to be turned over after each blow. For axles over [illegible] in. diameter at center add 2 ft. to height of drop for each ¼ in. increase at center	To conform [illegible] print	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	1,640	23	[illegible]	[illegible]	[illegible]	[illegible]	Axle to be turned over after each blow. Increase height of drop 1 ft. for each ⅛ in. in diameter [illegible] at center	Conform to [illegible] specifications	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Borings to be taken from [illegible] of axle half way between center and circumference	[illegible]	1,640	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Drop machine same as M. C. B.	[illegible] to drawings [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Test piece 6 in. long cut from test axle. Borings for analysis will be taken by ⅝ in. diameter drill acting parallel to axis of axle at a point on radial line [illegible] of distance from center to circumference	[illegible]	1,640	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Drop machine same as M. C. B.	Must be made [illegible] and must conform to the dimensions on print furnished. Must not fall below dimensions or exceed them by more than [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	1,640	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Turn axle over after each blow	Leave all parts marked [illegible] to allow for finishing	[illegible]	Accurately centered	[illegible]	One test [illegible]
[illegible]	[illegible]	[illegible]	1,640	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Ditto	Ditto	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Drillings for analysis to be taken half way between center and [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Ditto	Ditto	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Axle to be turned after 1st [illegible] blows	To be forged [illegible]	Stamp maker's name, date and [illegible] of manufacture	[illegible]	[illegible]	One test [illegible]
[illegible]	[illegible]	[illegible]	1,640	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	To be turned over after each blow	To agree exactly with drawing	[illegible]	[illegible]	[illegible]	One test [illegible]
[illegible]	[illegible]	[illegible]	1,640	[illegible]	[illegible]	[illegible]	[illegible]	6 after first blow	Rigid supports. Axle to be turned over after each blow. Axle to receive [illegible] blows	Ditto	[illegible]	[illegible]	[illegible]	One test [illegible]
[illegible]	[illegible]	Journals [illegible]	1,640	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Axle to be turned over after each blow	Must conform in shape and dimensions on drawing [illegible] fall below dimensions [illegible] them by more than [illegible]	[illegible]	[illegible]	[illegible]	One axle [illegible] heat
[illegible]	[illegible]	[illegible]	1,640	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Drop machine same as M. C. B. Axle to be turned over after 1st, 3d and [illegible] blows [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	1,640	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Drop machine same as M. C. B. [illegible] to be turned after each blow	Rough [illegible]	[illegible]	[illegible]	[illegible]	[illegible] axle from each heat. Notify purchasing agent [illegible] days before 100 or more are ready for inspection
[illegible]	Two test pieces cut from test axle [illegible]	[illegible]	1,640	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Axles to be turned over after 1st and [illegible] blows [illegible]	Conform to [illegible]	Stamp maker's name [illegible] heat and date [illegible]	[illegible]	[illegible]	[illegible] 25 axles from a heat, each heat to [illegible] separately [illegible] heat, and [illegible] of a heat to be [illegible] at random
[illegible]	[illegible]	[illegible]	1,640	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Axles to be turned over after each blow	Conform to shape [illegible]	Stamp maker's name and heat number	[illegible] centers	[illegible]	[illegible] tested at mill notify Supt. M. P. [illegible]
[illegible]	[illegible]	[illegible]	1,640	23	[illegible]	[illegible]	[illegible]	[illegible]	Axle to be turned over after each blow	Conform to prints [illegible]	Stamp steel [illegible] letters [illegible] maker's name on body of axle [illegible]	[illegible]	[illegible]	Test axle to be supplied for each 100 [illegible] at random [illegible]
[illegible]	Drillings for analysis to be taken from end of test axle [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Stamp [illegible]	[illegible] centers	[illegible]	Test axle from each heat will be [illegible] at mill. Notify [illegible] of tests [illegible] before ready for test
[illegible]	[illegible]	[illegible]	1,640	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Axle to be turned over after each blow	M. C. B. [illegible]	[illegible]	[illegible]	[illegible]	[illegible] axle for each 100. If first fails two [illegible] stand test to pass lot
[illegible]	Piece [illegible] long to be sent to [illegible] laboratory from which drillings will be taken for analysis with ⅝ in. diam. drill on radial line [illegible] of distance out from centre to circumference of axle	[illegible]	1,640	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Drop machine same as M. C. B. Axle to be turned over after 1st and 3d blows	[illegible]	Stamp [illegible] name of maker and heat number	[illegible] centre	[illegible]	[illegible] R. R. Co.

SYNOPSIS OF SPECIFICATIONS. STEEL FOR FORGINGS OF AXLES, CONNECTING RODS AND CRANK PINS.

COMPILED FOR COMMITTEE NO. 1 —AMERICAN SECTION, INTERNATIONAL ASSOCIATION FOR TESTING MATERIALS, JANUARY, 1900.

BULLETIN NO. 13.

Names.	Kind of Steel	Test piece for analysis.	Kind of forging.	Chemical composition. "D" denotes desired, "B" below and "A" above. Carbon. D.	Carbon. Not D.	Carbon. Not A.	Manganese. D.	Manganese. Not B.	Manganese. Not A.	Silicon. D.	Silicon. Not D.	Silicon. Not A	Phosphorus D.	Phosphorus Not D.	Phosphorus Not A.	Sulphur. D.	Sulphur. Not B.	Sulphur. Not A	Physical properties. Ultimate strength. Lbs. per sq. in.			Elongation, Per cent.		Test piece.	Remarks.
Feb. 1, 1899	O. H	... .	Miscellaneous.	...									.	...	.05	....	..	.05	85,000	80,000	90,000	20 in 2 in.	17 in 2 in	Each test specimen to be machined cold, longitudinally taken from a prolonged portion of forging midway between centre axis and surface. Size, 2 in. × ⅝ in. diam.	Not less than 25% by weight to be discarded from top end as cast of each ingot. Defective forging will be returned at manufacturer's expense.
M - Ry	O. H	......	Piston rods.	...		....									.05	.	...	.05	....	60,000	70,000	....	22 in 8 in.		
Valley R., M. P. 11, Sept. 16 '95.	O. H		..	...	...	.							..		.06	...	...	.06	85,000	80,000	..	20 in 2 in.	17 in 2 in.	Longitudinal specimen 2 in. long × ⅝ in. diam., machined cold half way between central axis and outside; from full-sized prolongation. See remarks.	25% discard from top of ingot. Test piece must be cut from upper end of upper bloom in ingot.
R. R. R. Oct., 1899.	O. H		. .		.27	.40	...		.60			.	...		.04	..	.	.04	80,000	75,000	85,000	......	20 in 2 in.		
ma R. R. Co., 5a, Dec. 1, 1899.	O. H.	See test column.	Driving axles.	.40	.35	.50	.50	.	.60	.20		.15	.03	.	.05	.03	....	....	....	..	...		......	Drillings will be taken with ⅝ in. drill 40% of distance out from centre of axle; from crop end each melt.	
nna R. R. Co., 6, Nov. 8, 1897.	O. H	Same as for driving axles.	Crank pins.	.45	.	....	.60			.05			.03	.	.05	.04	.		85,000	See remarks 80,000	95,000	18 in 8 in.	12 in 8 in.	Two from one pin selected from each lot of 50, centre line of test must not be nearer than 1 in. to centre line of pin.	Variation between two tests of same pin must not exceed 5,000 T. S. or 5% elongation.
, 4th, Sept. 1, 1898	O. H	... .	Crank pins.		.40		..		.					....	.05	.		.04	90,000	85,000	..	15 in 2 in.	15 in 2 in. if T. S. is ab've 90,000 lbs. 12½.	Two tests ½ in. diam. × 2½ in. between shoulders cut from pin of each heat, cut midway between centre and edge.	As many pins as possible to be made from a heat.
, 3a, Feb. 1, 1897	O. H	Check analysis from test piece.	Driving axles	..	.35	.			.60						.06			.04	E. L. 40,000	80,000		.....	18 in 2 in.	Two tests ½ in. diam. × 2½ in. between shoulder to be cut from extra length of axle, from each heat. Centre line of test to be midway between centre and edge. The extra length to be nearly cut off so that it can be broken off at destination.	As many axles as possible to be made from a heat. To be rough turned throughout 60° centres cut to exact length.
19a, Aug. 1, 1896	O. H	Check analysis from test piece	Main and parallel rods.	.	.	.			.60						.05	..	.	.04	. .	70,000	80,000	..	20 in 2 in.	Same as above.	As many rods as possible to be made from a heat.
Northwestern R., Apr. 1. '98.	O. H	.	Parallel rods.	..	...										.	.	.		.	75,000			18 in 8 in.	One end of each bloom must be drawn to a test piece 2 in. square × 18 in. long. To remain attached until bloom is inspected.	
Kansas & Texas, Feb. 2, 1900.	O. H	. ..	Miscellaneous,												.05	..		..	85,000	60,000	..	20 in 2 in.	15 in 2 in.	Test piece cut from forging 4 in. in diam. hammered from bloom and allowed to cool.	
Feb 1, 1896			Piston rods.	. .	..					.	.					..	. .		..	70,000	80,000	......	20 in 2 in.	One rod from each heat must be 6 in. extra long and from this two test pieces will be cut.	
			Parallel rods.		..															70,000	80,000	...	20 in 2 in.	Same as above.	Rods must be taken from as few heats as possible.
, May 9, 1896..			Crank pins.												.05	.				80,000	...		15 in 2 in.	One pin from each heat will have two test pieces cut from it.	As many pins from each heat as possible.
, May 9, 1895.			Driving axles.												.07	.				80,000	.		18 in 8 in.	One axle from each heat will be made 6 in. extra long and from this two test pieces will be cut.	As many axles as possible from each heat.
	O. H	See test piece.	Locomotive and tender axles.		.				70						.07				.	..	.			Drillings to be taken from end of each test axle in presence of inspector. Analysis to be made by Southern Ry. Co.'s chemist.	As many axles as possible from each heat, preferably 50 or more, never less than 30.
B. & R. R. Co., Feb 20, 1897	O. H	... .	Side and piston rods.		.25	.40			65						.05	...		.05		70,000	80,000		22 in 4 in.	One end of each billet to be drawn down by manufacturer to a test bar 2 in. square and 10 in. long. To remain attached to billet.	
B. & R. R. Co	O. H	. .....	Crank pins.		.30	.45			.65						.05		.	.05		75,000	85,000		20 in 4 in.	Same as above.	
B. & R. R. Co		See test piece.	Driving and engine truck axl's.		35	.50			60		..	.05	.		.05	..		.04	... ..	75,000	85,000		20 in 4 in.	Borings will be taken from end of axle, half way between centre and circumference.	All axles must be annealed after forging. Etching test must show homogeneous material free from elongated blow holes or lap overs.
& W. R. Co., 7a, Jan 1, 1891		.	Crank pins.										..		.	.			85,000	80,000		15 in 2 in.	12 in 2 in.	One pin from every 51 to have two test pieces cut out.	
& W. R. Co., 8b, Apr. 25, 1894			Rods and guides.												.05	.			......	80,000	..		15 in 2 in.	One billet from each shipment will have a piece drawn from it under the hammer about 2 in. square by 12 in. long.	
L. W., June 1, 1897	O. H	See test piece.	Axles pins, rods, guides and similar forgings	.40					60						.05	.		.05	80,000	75,000	90,000	20 in 2 in.	15 in 2 in.	Test piece to be machined cold from a full size bloom from each heat. Drillings must be taken from a point midway between centre and surface of bloom.	
ennsylvania R. R. Co.	... .	.	Main and parallel rods.										.		.				85,000	80,000	. .	15 in 2 in.	12 in 2 in.	One billet from each 25 to be drawn down under hammer and turned to ⅝ in. diam. 2 in. long.	

Number and Location of Tensile Specimens.

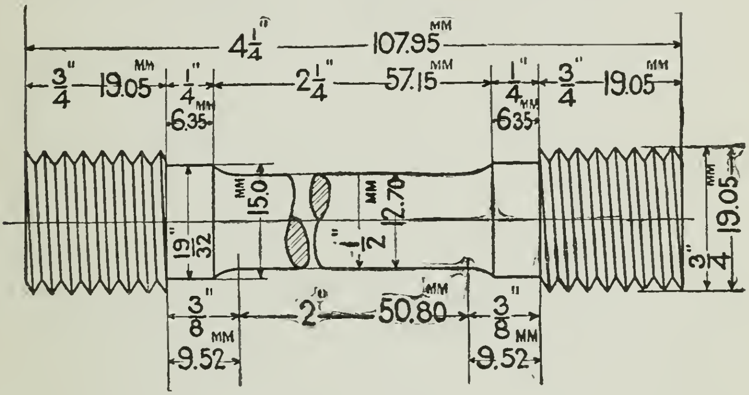
8. For driving axles one longitudinal test specimen shall be cut from one axle of each melt. The center of this test specimen shall be half way between the center and outside of the axle.

6. Carbon steel and nickel steel driving wheel axles shall not be subject to the above drop test.

TEST PIECES AND METHODS OF TESTING.

Test Specimen for Tensile Test.

7. The standard turned test specimen one-half inch (1/2″) diameter and two inch (2″) gauged length, shall be used to determine the physical properties specified in paragraph No. 4. It is shown in the following sketch:



Number and Location of Tensile Specimens.

8. One longitudinal test specimen shall be cut from one axle of each melt. The center of this test specimen shall be half way between the center and outside of the axle.

Drop Test Described.

9. The points of supports on which the axle rests during tests must be three feet apart from center to center; the tup must weigh 1,640 pounds; the anvil, which is supported on springs, must weigh 17,500 pounds; it must be free to move in a vertical direction; the springs upon which it rests must be twelve in number, of the kind described on drawing; and the radius of supports and of the striking face on the tup in the direction of the axis of the axle must be five (5) inches. When an axle is tested it must be so placed in the machine that the tup will strike it midway between the ends, and it must be turned over after the first and third blows, and when required, after the fifth blow. To measure the deflection after the first blow prepare a straight edge as long as the axle, by reinforcing it on one side,

equally at each end, so that when it is laid on the axle, the reinforced parts will rest on the collars or ends of the axle, and the balance of the straight edge not touch the axle at any place. Next place the axle in position for test, lay the straight edge on it, and measure the distance from the straight edge to the axle at the middle point of the latter. Then after the first blow, place the straight edge on the now bent axle in the same manner as before, and measure the distance from it to that side of the axle next to the straight edge at the point farthest away from the latter. The difference between the two measurements is the deflection.

Yield Point.

10. The yield point specified in paragraph No. 4 shall be determined by the careful observation of the drop of the beam, or halt in the gauge of the testing machine.

Sample for Chemical Analysis.

11. Turnings from the tensile test specimen of driving axles, or drillings taken midway between the center and outside of car, engine, and tender truck axles, or drillings from the small test ingot if preferred by the inspector, shall be used to determine whether the melt is within the limits of chemical composition specified in paragraph No. 2.

FINISH.

12. Axles shall conform in sizes, shapes and limiting weights to the requirements given on the order or print sent with it. They shall be made and finished in a workmanlike manner, and shall be free from all injurious cracks, seams or flaws. In centering, sixty (60) degree centers must be used, with clearance given at the point to avoid dulling the shop lathe centers.

BRANDING.

13. Each axle shall be legibly stamped with the melt number and initials of the maker at the places marked on the print or indicated by the inspector.

INSPECTION.

14. The inspector representing the purchaser, shall have all reasonable facilities afforded to him by the manufacturer to satisfy him that the finished material is furnished in accordance with these specifications. All tests and inspections shall be made at the place of manufacture, prior to shipment.

equally at each end, so that when it is laid on the axle, the reinforced parts will rest on the collars or ends of the axle, and the balance of the straight edge not touch the axle at any place. Next place the axle in position for test, lay the straight edge on it, and measure the distance from the straight edge to the axle at the middle point of the latter. Then after the first blow, place the straight edge on the now bent axle in the same manner as before, and measure the distance from it to that side of the axle next to the straight edge at the point farthest away from the latter. The difference between the two measurements is the deflection. The report of the drop test shall state the atmospheric temperature at the time the tests were made.

INTERNATIONAL
ASSOCIATION FOR TESTING MATERIALS.

AMERICAN SECTION.

BULLETIN No. 14. MAY, 1900.

PROPOSED STANDARD SPECIFICATIONS
FOR
STEEL TIRES.

RECOMMENDED BY AMERICAN BRANCH OF COMMITTEE No. 1, MAY 1, 1900.

There will be a discussion of these specifications at the Third Annual Meeting of the American Section, to be held in New York, on October 25-27, 1900, and you are requested to send in your views by letter, or to be present and take part in the oral discussion.

After the Annual Meeting, Committee No. 1 will consider the points raised, and make any modifications that may be found necessary; and, if so decided at the Annual Meeting, the specifications will be sent to all members of the American Section for approval by letter ballot.

If the other countries perform their work in the same general manner, the final work of the introduction of International Specifications will be reduced to a very simple matter, as there will only be a limited number of specifications to consider instead of hundreds as at the present time.

WM. R. WEBSTER,
Chairman of American Branch of Committee No. 1.

PROCESS OF MANUFACTURE.

1. Steel for tires may be made by either the open-hearth or crucible process.

CHEMICAL PROPERTIES.

2. There will be three classes of steel tires which shall conform to the following limits in chemical composition :

	Passenger engines. Per cent.	Freight engine and car wheels. Per cent.	Switching engines. Per cent.
Manganese shall not exceed	0.80	0.80	0.80
Silicon shall not be less than	0.20	0.20	0.20
Phosphorus shall not exceed	0.05	0.05	0.05
Sulphur shall not exceed	0.05	0.05	0.05

PHYSICAL PROPERTIES.

Tensile Tests.

3. The minimum physical qualities required in each of the three classes of steel tires shall be as follows :

	Passenger engines.	Feight engine and car wheels.	Switching engines.
Tensile strength, pounds per square inch	100,000	110,000	120,000
Elongation, per cent in two inches	12	10	8

Drop Test.

4. In the event of the contract calling for a drop test, a test tire from each melt will be furnished at the purchaser's expense, provided it meets the requirements. This test tire shall stand the drop test described in paragraph No. 7, without breaking or cracking, and shall show a minimum deflection equal to $D^2 \div (40T^2 + 2D)$, the letter "D" being internal diameter and the letter "T" thickness of tire at center of tread.

TEST PIECES AND METHODS OF TESTING.

Test Specimen for Tensile Tests.

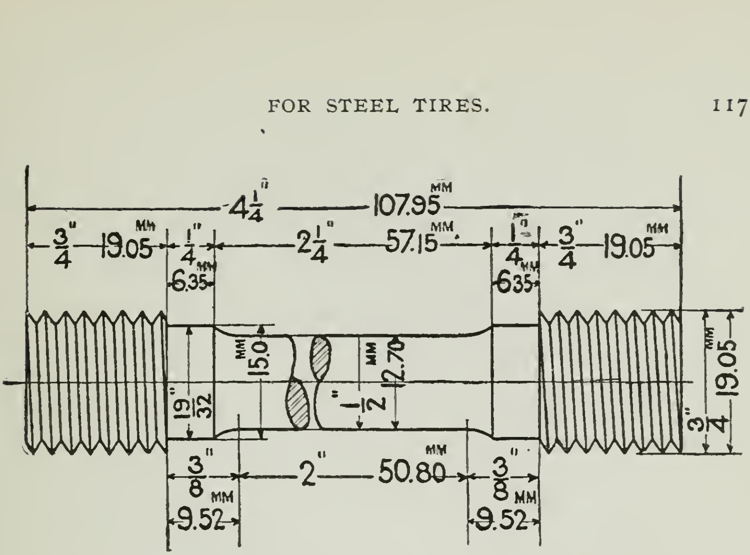
5. The standard turned test specimen, one-half inch (1/2") diameter and two inch (2") gauged length, shall be used to determine the physical properties specified in paragraph No. 3. It is shown in the following sketch :

SYNOPSIS OF SPECIFICATIONS FOR STEEL TIRES.

COMPILED FOR COMMITTEE NO. 1.—AMERICAN SECTION, INTERNATIONAL ASSOCIATION FOR TESTING MATERIALS.

BULLETIN NO. 14.

Name.	Designation.	Diameter.	Test pieces for Chemical Analysis.	Chemical Composition.										Test piece.	Physical properties.							Drop Test.		Drop Test.		Dimensions of finished tire.	Finish.	Dranding.	Inspection.
				Carbon.		Phosphorus.		Manganese.		Sulphur.		Silicon.			Ultimate strength.			Elongation.		Reduction of area.	Bend.	Weight of drop.	Height of drop.	Minimum Deflection.	Remarks.				
				Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.		Desired.	Min.	Max.	Desired.	Allowed variation.										
		Inches.		Per cent.											Pounds per sq. in.			Per cent.				lbs.	feet.						
Baltimore [illegible] Jan. 13, 1900	Passenger engine Freight Switch engine, cars, etc.	60 and over. Between 45 and 60. 46 and under.	Tire turnings and broken test pieces.	.50 .60 .68	.60 .70 .78	.. .. ..	[illegible]		70 70 70		.04 .04 .04		.25 25 25	¾-in. dia. × 4½ in. long between shoulders taken from an ingot of same heat from which tire is rolled.	105,000 115,000 125,000	95,000 105,000 115,000	115,000 125,000 135,000	16 in 4 in. 14 in 4 in. 10 in 4 in.	2 below. " "							Conform to dimensions shown on drawings furnished by company.	Free from cracks, flaws or other imperfections.		Maker must furnish inspector analysis of heat from which tire ingot and test ingot were obtained. Analysis of test ingot must agree with tire ingot.
Southern [illegible] Alabama Great [illegible] May 12, 1899	Engine. Engine and truck.	50 or over Under 50.	Tire turnings and broken test pieces.		...				70		.045		30	From each heat which has received same amt. of work as tires ¾ in. dia.		105,000 115,000	120,000 130,000	15 in 4 in. 13 in 4 in.	Decrease of 1 for increase of 5,000 lbs.							Difference in outside circumferences of tires must not be more than ⅛ in.	Free from cracks, flaws or other imperfections.	Each tire stamped with serial number, heat number and makers' name.	Maker must furnish inspector all necessary facilities for inspection. Analysis of test pieces must agree with analysis of turnings from any of tires made from same heat.
London and [illegible] of England, rec[illegible]														2 test pieces machined cold from tire.		98,560		15 in 2 in.				2,240	10, 15, 20, 25, 30 and upwards.	⅙ external diameter.	1 addit'nal tire for each 50 ordered selected and must stand test without breaking or cracking.	Turned so that diam and thickness shall be exactly similar.		Each tire stamped with maker's name, date of manufacture, and number of charge.	
Japanese, r[illegible] in 1[illegible]																100,000	107,000			20				2 in. per ft. of diameter	2 tires tested without showing any signs of fractures.				
Oude and R[illegible] Railway, received by [illegible]														Cut cold from tested tires and turned to dimensions used at Woolwich for gun tests		100,800		20				2,240	5, 10, 15 and upwards.	2 in. per ft. of diameter.	2% of tires tested without showing any signs of flaws or cracks.				
New South [illegible] of Railways														From tested tire test process of original area of ½ in. sq. in. (.798 dia.) and effective length between datum points of 2 in.		103,010	112,000	15 in 2 in		25		2,240	10, 15, 20, 25 and upwards.	⅙ external diameter, small bogie less than 3 ft., ⅛ external diameter.	1 additional tire for every 50 ordered selected, and must stand test without breaking or cracking.			Maker's name, date of manufacture, stamped on outer edge of tire, near inner circle. Class letter painted white inside of tire.	
Cross C[illegible]	Medium grade. Hard grade.			.60 .68	70 78				70 70		04 04		25 25					14 in 4 in.											
Egyptian [illegible] received [illegible]														Area of ¼ sq. in. by effective length of 2 in.		112,000	123,200	12 to 15 in 2 in.					Various heights up to 25.	⅙ diameter.	Without showing any signs of fracture.				
Livesey [illegible] 315, rec[illegible]														Cut cold from tested tire a test piece of area of ½ sq. in and an effective length of 2 in.	118,720	114,210	123,200	10 in 2 in.				2,240	5, 10, 15, 25 and upwards.	⅛ internal diam. small tires less than 3 ft., 1/10 tires outside dia., 28 in. x 3 in. tread 1/12 inside.	Tire test will be made for each blow, and in no case less than 2% of order. No signs of a fracture.				
Burma R[illegible]			Broken test pieces.	.55	63	..			[illegible] under .02.		.035		.35	Cut cold from test tire, diam. .564 in., 2 in. effective length.		107,520	116,480	11% with max. ult. 15% with min. ult.				2,240	10 and upwards.	⅙ of I D.	1 tire from each heat.	To drawing.		Maker's name, date of manufacture, number of contract.	Person approved by Company's Engineer.
Livesey [illegible] 700, rec[illegible]																								$D^2 + 40T^2$	D = internal diameter. T = thickness of tire of centre of tread.				
Midland R[illegible] by us in [illegible]														Cut cold from test tire. 2 in. effective length.		100,000	108,000	20% in. 2.			¼ sq. angle 55% rad. ¾ in.	2,240	10 ft. and upwards, or hyd. press.	3 def. for each ft. of I D.					
Russian G[illegible] us in '9[illegible]														8 in. effective length, 8 in. diam. cut from test tire.		99,546		8% in 8 in.	$90 - \frac{\text{Ult.}}{1422}$ Eleng. x 2					Tires 2.56 in. thick stand 3 blows of 1102 lbs., drop, height 13¾ ft. or equivalent in ft., lbs.; ht. increased or decreased 7.1 in. for ¼ in. inc. or dec. in thickness of tire. 1% to be tested.				Stamped .16 in. deep, figures .4 in. high. Maker's name, date and number ½ in. from internal circumference.	
Finland S[illegible] in 189[illegible]														Cut cold from test tire. 8 in. effective length 5 in. diam.		92,440	99,550	15% in 8 in.					300 kilogrammeters, momentum.	⅛ external diameter.	1 tire from each heat or 2%.	To gauge.			
C. B. & Q. [illegible] 1893	[illegible] tires, pass. and frt. engines. Switch engines.			.55 .65	65 .75						.04 04		25 25	Test specimen from each heat forged 8 in. long x 1¼ in. diam. with approx. same work as tire													Free from imperfections.		



6. When the drop specimen is specified, this test specimen shall be cut cold from the tested tire at the point least affected by the drop test. If the diameter of the tire is such that the whole circumference of the tire is seriously affected by the drop test, or if no drop test is required, the test specimen shall be forged from a test ingot cast when pouring the melt, the test ingot receiving, as nearly as possible, the same proportion of reduction as the ingots from which the tires are made.

Location of Tensile Specimens.

7. The test tire shall be placed vertically under the drop in a running position on a solid foundation of at least ten tons in weight and subjected to successive blows from a tup weighing 2240 pounds, falling from increasing heights until the required deflection is obtained.

Drop Test Described.

8. Turnings from the tensile specimen, or drillings from the small test ingot, or turnings from the tire if preferred by the inspector, shall be used to determine whether the melt is within the limits of chemical composition specified in paragraph No. 2.

Sample for Chemical Analysis.

FINISH.

9. All tires shall be free from cracks, flaws, or other injurious imperfections, and shall conform to dimensions shown on drawings furnished by the purchaser.

Branding.

10. Tires shall be stamped with the maker's brand and number in such a manner that each individual tire may be identified.

Inspection.

11. The inspector representing the purchaser, shall have all reasonable facilities afforded to him by the manufacturer to satisfy him that the finished material is furnished in accordance with these specifications. All tests and inspections shall be made at the place of manufacture, prior to shipment.

INTERNATIONAL

ASSOCIATION FOR TESTING MATERIALS.

AMERICAN SECTION.

BULLETIN No. 15. MAY, 1900.

PROPOSED STANDARD SPECIFICATIONS

FOR

STEEL FORGINGS.

RECOMMENDED BY AMERICAN BRANCH OF COMMITTEE NO. 1, MAY 1, 1900.

There will be a discussion of these specifications at the Third Annual Meeting of the American Section, to be held in New York, on October 25-27, 1900, and you are requested to send in your views by letter, or to be present and take part in the oral discussion.

After the Annual Meeting, Committee No. 1 will consider the points raised, and make any modifications that may be found necessary; and, if so decided at the Annual Meeting, the specifications will be sent to all members of the American Section for approval by letter ballot.

If the other countries perform their work in the same general manner, the final work of the introduction of International Specifications will be reduced to a very simple matter, as there will only be a limited number of specifications to consider instead of hundreds as at the present time.

WM. R. WEBSTER,
Chairman of American Branch of Committee No. 1.

PROCESS OF MANUFACTURE.

1. Steel for forgings may be made by the open-hearth, crucible or Bessemer process.

CHEMICAL PROPERTIES.

2. There will be four classes of steel forgings which shall conform to the following limits in chemical composition.

	Forgings of soft or low carbon steel. Per cent.	Forgings of carbon steel not annealed. Per cent.	Forgings of carbon steel, oil tempered or annealed. Per cent.	Forgings of nickel steel, oil tempered or annealed. Per cent.
Phosphorus shall not exceed...	0.10	0.06	0.04	0.04
Sulphur " ...	0.10	0.06	0.04	0.04
Nickel " ...	——	——	——	3.75

PHYSICAL PROPERTIES.

3. The minimum physical qualities required of the different sized forgings of each class shall be as follows:

Tensile Tests.

Tensile strength. Pounds per square inch.	Yield point. Pounds per square inch.	Elongation in 2". Per cent.	Contraction of area. Per cent.	
				SOFT STEEL OR LOW CARBON STEEL.
58,000	29,000	28	35	For solid or hollow forgings, no diameter or thickness of section to exceed 10".
				CARBON STEEL NOT ANNEALED.
75,000	37,500	18	30	For solid or hollow forgings, no diameter or thickness of section to exceed 10".
	Elastic limit.			CARBON STEEL ANNEALED.
80,000	40,000	22	35	For solid or hollow forgings, no diameter or thickness of section to exceed 10".
75,000	37,500	23	35	For solid forgings, no diameter to exceed 20" or thickness of section 15".
70,000	35,000	24	30	For solid forgings, over 20" diameter.
				CARBON STEEL, OIL TEMPERED.
90,000	55,000	20	45	For solid or hollow forgings, no diameter or thickness of section to exceed 3".

Tensile strength.	Elastic Limit.	Elongation in 2″.	Contraction of area.	
Pounds per square inch.		Per cent.		Carbon Steel, Oil Tempered.
85,000	50,000	22	45	For solid forgings of rectangular sections not exceeding 6″ in thickness or hollow forgings, the walls of which do not exceed 6″ in thickness.
80,000	45,000	23	40	For solid forgings of rectangular sections not exceeding 10″ in thickness or hollow forgings, the walls of which do not exceed 10″ in thickness.
				Nickel Steel Annealed.
80,000	50,000	25	45	For solid or hollow forgings, no diameter or thickness of section to exceed 10″.
80,000	45,000	25	45	For solid forgings, no diameter to exceed 20′ or thickness of section 15″.
80,000	45,000	24	40	For solid forgings, over 20″ diameter.
				Nickel Steel, Oil Tempered.
95,000	65,000	21	50	For solid or hollow forgings, no diameter or thickness of section to exceed 3″.
90,000	60,000	22	50	For solid forgings of rectangular sections not exceeding 6″ in thickness or hollow forgings, the walls of which do not exceed 6″ in thickness.
85,000	55,000	24	45	For solid forgings of rectangular sections not exceeding 10″ in thickness or hollow forgings, the walls of which do not exceed 10″ in thickness.

Bending Test.

4. A specimen one inch by one-half inch (1″ x 1/2″) shall bend cold 180° without fracture on outside of bent portion, as follows:

Around a diameter of 1/2″, for forgings of soft steel,

Around a diameter of 1 1/2″, for forgings of carbon steel not annealed,

Around a diameter of 1 1/2″, for forgings of carbon steel annealed, if 20″ in diameter or over,

Around a diameter of 1″, for forgings of carbon steel annealed, if under 20″ diameter,

Around a diameter of 1″ for forgings of carbon steel oil-tempered,

Around a diameter of 1/2″, for forgings of nickel steel annealed,

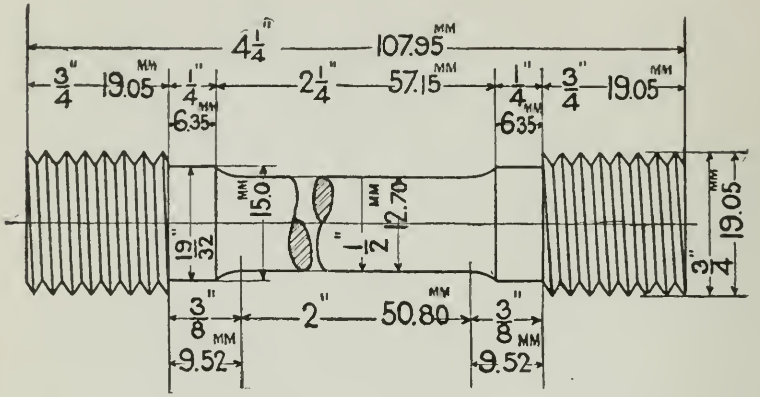
Around a diameter of 1″, for forgings of nickel steel oil-tempered.

Test Pieces and Methods of Testing.

5. The standard turned test specimen, one-half inch (1/2″) diam-

Test Specimen for Tensile Test.

eter and two inch (2″) gauged length, shall be used to determine the physical properties specified in paragraph No. 3. It is shown in the following sketch.



Number and Location of Tensile Specimens.

6. The number and location of test specimens to be taken from a melt, blow, or a forging shall depend upon its character and importance and must therefore be regulated by individual cases. The test specimens shall be cut cold from the forging or full-sized prolongation of same parallel to the axis of the forging and half way between the center and outside, the specimens to be longitudinal, *i. e.*, the length of the specimen to correspond with the direction in which the metal is most drawn out or worked. When forgings have large ends or collars, the test specimens shall be taken from a prolongation of the same diameter or section as that of the forging back of the large end or collar. In the case of hollow shafting, either forged or bored, the specimen shall be taken within the finished section prolonged, half way between the inner and outer surface of the wall of the forging.

Test Specimen for Bending.

7. The specimen for bending test one inch by one-half inch (1″ x 1/2″) shall be cut as specified in paragraph No. 6. The bending test may be made by pressure or by blows.

Yield Point.

8. The yield point specified in paragraph No. 3 shall be determined by the careful observation of the drop of the beam, or halt in the gauge of the testing machine.

Elastic Limit.

9. The elastic limit specified in paragraph No. 3 shall be determined by means of an extensometer, which is to be attached to the test specimen in such manner as to show the change in rate of extension under uniform rate of loading, and will be taken at that point where the proportionality changes.

Sample for Chemical Analysis.

10. Turnings from the tensile specimen or drillings from the bending specimen or drillings from the small test ingot, if preferred by the inspector, shall be used to determine whether or not the steel is within the limits in chemical composition specified in paragraph No. 2.

FINISH.

11. Forgings shall be free from cracks, flaws, seams or other injurious imperfections, and shall conform to dimensions shown on drawings furnished by the purchaser, and be made and finished in a workmanlike manner.

INSPECTION.

12. The inspector representing the purchaser shall have all reasonable facilities afforded to him by the manufacturer to satisfy him that the finished material is furnished in accordance with these specifications. All tests and inspections shall be made at the place of manufacture, prior to shipment.

INTERNATIONAL
ASSOCIATION FOR TESTING MATERIALS.

AMERICAN SECTION.

BULLETIN No. 16. MAY, 1900.

PROPOSED STANDARD SPECIFICATIONS
FOR
STEEL CASTINGS.

RECOMMENDED BY AMERICAN BRANCH OF COMMITTEE No. 1, MAY 1, 1900.

There will be a discussion of these specifications at the Third Annual Meeting of the American Section, to be held in New York, on October 25-27, 1900, and you are requested to send in your views by letter, or to be present and take part in the oral discussion.

After the Annual Meeting, Committee No. 1 will consider the points raised, and make any modifications that may be found necessary; and, if so decided at the Annual Meeting, the specifications will be sent to all members of the American Section for approval by letter ballot.

If the other countries perform their work in the same general manner, the final work of the introduction of International Specifications will be reduced to a very simple matter, as there will only be a limited number of specifications to consider instead of hundreds as at the present time.

WM. R. WEBSTER,
Chairman of American Branch of Committee No. 1.

PROCESS OF MANUFACTURE.

1. Steel for castings may be made by the open-hearth, crucible or Bessemer process. Castings to be annealed or unannealed as specified.

CHEMICAL PROPERTIES.

Ordinary Castings.

2. Ordinary castings, those in which no physical requirements are specified, shall not contain over 0.40 per cent. of carbon, nor over 0.08 per cent. of phosphorus.

Tested Castings.

3. Castings which are subjected to physical test shall not contain over 0.05 per cent. of phosphorus, nor over 0.05 per cent. of sulphur.

PHYSICAL PROPERTIES.

Tensile Tests.

4. Tested castings shall be of three classes: "HARD," "MEDIUM," and "SOFT." The minimum physical qualities required in each class shall be as follows:

	Hard castings.	Medium castings.	Soft castings.
Tensile strength, pounds per square inch	85,000	70,000	60,000
Yield point, pounds per square inch....	38,250	31,500	27,000
Elongation, per cent. in two inches	15	18	22
Contraction of area, per cent...........	20	25	30

Drop Test.

5. A test to destruction may be substituted for the tensile test, in the case of small or unimportant castings, by selecting three castings from a lot. This test shall show the material to be ductile and free from injurious defects, and suitable for the purposes intended. A lot shall consist of all castings from the same melt or blow, annealed in the same furnace charge.

Percussive Test.

6. Large castings are to be suspended and hammered all over. No cracks, flaws, defects, nor weakness shall appear after such treatment.

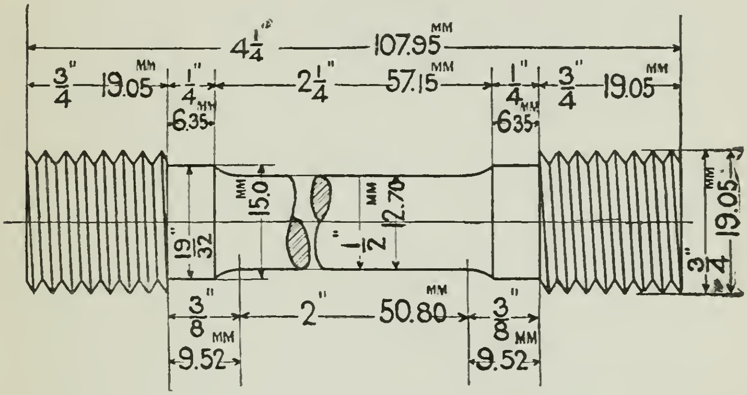
Bending Test.

7. A specimen one inch by one-half inch (1″ x 1/2″) shall bend cold around a diameter of one inch (1″) without fracture on outside of bent portion, through an angle of 120° for "SOFT" castings, and of 90° for "MEDIUM" castings.

TEST PIECES AND METHODS OF TESTING.

Test Specimen for Tensile Test.

8. The standard turned test specimen, one-half inch (1/2″) diameter and two inch (2″) gauged length, shall be used to determine the physical properties specified in paragraph No. 4. It is shown in the following sketch:



Number and Location of Tensile Specimens.

9. The number of standard test specimens shall depend upon the character and importance of the castings. A test piece shall be cut cold from a coupon to be molded and cast on some portion of one or more castings from each melt or blow or from the sink-heads (in case heads of sufficient size are used). The coupon or sink-head must receive the same treatment as the casting or castings, before the specimen is cut out, and before the coupon or sink-head is removed from the casting.

Test Specimen for Bending.

10. One specimen for bending test one inch by one-half inch (1″ x 1/2″) shall be cut cold from the coupon or sink-head of the casting or castings as specified in paragraph No. 9. The bending test may be made by pressure, or by blows.

Yield Point.

11. The yield point specified in paragraph No. 4 shall be determined by the careful observation of the drop of the beam or halt in the gauge of the testing machine.

12. Turnings from the tensile specimen, drillings from the bending specimen, or drillings from the small test ingot, if pre-

Sample for Chemical Analysis.

ferred by the inspector, shall be used to determine whether or not the steel is within the limits in phosphorus and sulphur specified in paragraphs Nos. 2 and 3.

FINISH.

13. Castings shall be true to pattern, free from blemishes, flaws or shrinkage cracks. Bearing surfaces shall be solid, and no porosity shall be allowed in positions where the resistance and value of the casting for the purpose intended, will be seriously affected thereby.

INSPECTION.

14. The inspector representing the purchaser, shall have all reasonable facilities afforded to him by the manufacturer to satisfy him that the finished material is furnished in accordance with these specifications. All tests and inspections shall be made at the place of manufacture, prior to shipment.

INTERNATIONAL
ASSOCIATION FOR TESTING MATERIALS.

AMERICAN SECTION.

BULLETIN No. 17. MAY, 1900.

PROPOSED STANDARD SPECIFICATIONS
FOR
WROUGHT IRON.

Recommended by American Branch of Committee No. 1, May 1, 1900.

There will be a discussion of these specifications at the Third Annual Meeting of the American Section, to be held in New York, on October 25-27, 1900, and you are requested to send in your views by letter, or to be present and take part in the oral discussion.

After the Annual Meeting, Committee No. 1 will consider the points raised, and make any modifications that may be found necessary; and, if so decided at the Annual Meeting, the specifications will be sent to all members of the American Section for approval by letter ballot.

If the other countries perform their work in the same general manner, the final work of the introduction of International Specifications will be reduced to a very simple matter, as there will only be a limited number of specifications to consider instead of hundreds as at the present time.

Wm. R. Webster,
Chairman of American Branch of Committee No. 1.

PROCESS OF MANUFACTURE.

1. Wrought iron shall be made by the puddling process or rolled from fagots or piles made up from No. 1 wrought iron scrap, alone or with muck bar added, it being understood that test iron Class B, and stay-bolt iron contain no scrap.

PHYSICAL PROPERTIES.

Tensile Test.

2. The minimum physical qualities required in the four classes of wrought iron shall be as follows:

	Refined iron.	Test iron Class A.	Test iron Class B.	Stay-bolt iron.
Tensile strength, pounds per sq. inch	48,000	48,000	50,000	46,000
Yield point, pounds per sq. inch	25,000	25,000	25,000	25,000
Elongation, per cent. in 8 inches	15	20	25	28

3. In sections weighing less than 0.654 pound per lineal foot the percentage of elongation required in the four classes specified in paragraph No. 2 shall be 11.25 per cent., 15.00 per cent., 18.75 per cent., and 21.00 per cent. respectively.

Nicking Test.

4. The four classes of iron when nicked and tested as described in paragraph No. 9 shall show the following fracture:

(*a*). Refined iron, a generally fibrous fracture, free from coarse crystalline spots. Not over 15 per cent. of the fractured surface shall be granular.

(*b*). Test iron Class A, a generally fibrous fracture, free from coarse crystalline spots. Not over 10 per cent. of the fractured surface shall be granular.

(*c*). Test iron Class B, a long, clean, silky fiber, free from slag or dirt or any coarse crystalline spots. A few fine crystalline spots may be tolerated provided they do not in the aggregate exceed 10 per cent. of the sectional area of the bar.

(*a*). Stay-bolt iron, a long, clean, silky fiber, free from slag or dirt, and wholly fibrous, being practically free from crystalline spots.

SYNOPSIS OF SPECIFICATIONS FOR WROUGHT IRON

COMPILED FOR COMMITTEE No. 1.—AMERICAN SECTION, INTERNATIONAL ASSOCIATION FOR TESTING MATERIALS

					Physical Properties								Test pieces					
[illegible]	Name of material	Process of Manufacture	[illegible]	Sulphur	Tensile strength	Elastic limit	Elong. Per cent	Red. of area. Per cent	Nicking test	Cold bending test	Hot bending test	[illegible] test	For tensile	For nicking	For bending	For drifting	Finish	Inspection
Long [illegible]	Bar [illegible]	None	[illegible]	[illegible]	47,000 to 49,000 lbs	None	[illegible]	None	Iron to be fibrous, and free from crystallization	None	None	[illegible]	No standard given	None	None	[illegible]	[illegible] made to the sizes ordered and [illegible] material will be rejected that varies more than [illegible] per running foot	No statement
The [illegible]	[illegible] bar [illegible]				None	"	[illegible]	"	Bars not exceeding 1¼ in. nicked and bent over an anvil, must show a fracture uniformly fibrous. Larger sizes not more than 20% crystalline	D = 2T, without showing cracks or flaws	D 1T		None	1¼ in. sec. area	1¼ in. sec. area		[illegible] free from [illegible] correct welds, crop ends not cut too [illegible]	"
	[illegible]				"		[illegible]		Bars not exceeding 1⅝ in. nicked and bent must show a fracture uniformly fibrous. Larger sizes not more than 15% crystalline.	180° flat upon itself without showing cracks or flaws	Same as cold bending test		"	1⅝ in. sec. area	1⅝ in. sec. area		Ditto.	"
	[illegible]				50,000 lbs	.	[illegible]	10	Test piece after being broken in test machine when nicked and bent must show a fibrous fracture	None.	None		No standard given	Use test piece broken in machine	None		Ditto	
	[illegible]				50,000 lbs		[illegible] in	18	Bars ⅞ or 1 in. diam. when nicked and bent must show a uniformly fine fibrous fracture	The bar must stand cold bending double both ways without showing fracture or flaws	"		⅞ or 1 in. round bars tested as rolled.	⅞ or 1 in. round bars	⅞ or 1 in. round bars		Ditto.	
Holla [illegible]		[illegible]			48,000 lbs		[illegible]	None	Test piece after being broken in test machine when nicked and bent the fracture should be fibrous and not crystalline or short	None	"		No standard given	Unit test piece broken in machine	None		[illegible] size ordered and be free from [illegible] iron, 1 in. and below, [illegible] sizes above 1 in. [illegible] in either [illegible] variation either way allowed	
[illegible]		[illegible] originally [illegible] must [illegible] be free from [illegible]			50,000 lbs. min. [illegible] lbs. max.		Round [illegible] Flat [illegible]		When nicked slightly on one side and broken by a succession of light blows it must show a generally fibrous structure not more than 25% crystalline free from steel	"			1½ sq. in.	No size given			[illegible] to the ordered dimensions, and [illegible] cracks and burned edges.	One bar from each 100 will be selected at random and [illegible] to the Testing Dept. at Altoona for testing
[illegible]		None			Not less than [illegible] lbs.	Between [illegible] and 30,000 lbs.		[illegible] less [illegible] in [illegible]	A bar nicked about .20% and bent back through an angle of 180°, must show a long clean silky fibre, free from slag or dirt or any coarse crystalline spots. A few fine spots may be tolerated but must not exceed 10% of the area of the bar	A bar not more than 1 in. in thickness must bend 180° flat upon itself without cracks or flaws	A bar not over 1 in. in thickness heated to a yellow heat and quenched in water between 75 and 82° F. must bend 180° flat upon itself, must work and weld in ordinary manner without signs of red shortness	[illegible] panded [illegible] round [illegible] whose [illegible] less than [illegible] ameter of the [illegible] until a [illegible] rmed, [illegible] is not [illegible] the di[illegible]	Not less than ½ sq. in. sectional area	Bar not more than [illegible] in. thickness	Bar not more than [illegible] in. thickness	[illegible]	Fr[illegible] cracks, flaws, scabs or cinder spots.	No statement
[illegible]					48,000 lbs	None	[illegible]	None	None.	Sizes ⅞ in. thick or less must bend cold 180° D 1T. Sizes larger than ⅞ in. must bend 180° D 1½T	All sizes 180° flat without fracture	None	½ in. sectional area	None	All sizes so far as practicable	None	[illegible] rap, flaws, blisters or unwelded [illegible] finish. Round iron to conform to [illegible] Flat iron must not vary [illegible]	If made at the mill the mfr. must prepare samples selected by inspr. and furnish test machines and such assistance as may be necessary
[illegible]					Bars ⅝ in. thick or less 48,000 lbs., other sections and for rounds 49,000 lbs	"		"	Iron must be fibrous and free from crystallization	None.	None	.	Test piece will be pulled in original section so far as capacity of test machine allows				[illegible] made to the sizes ordered [illegible] and must not vary more than [illegible]	Mfrs. must furnish free the necessary apparatus and assistance for making tests at the mills
					Not less than 48,000 lbs. [illegible] ½ in. thick or less [illegible] of 47,000 lbs.	25,000 lbs. 24,000 lbs.			Fibrous fracture. "	"	"		No standard given.	No standard given	None		[illegible] s and cinder spots and rough [illegible] more than 2½% from estimated wt.	Material will be inspected and tested on its arrival at destination
[illegible]		[illegible]	[illegible]		[illegible] at least [illegible] rap will be rejected													
[illegible]					Round sections [illegible] lbs Rectangular sections, 48,000 lbs	None. "			"	[illegible] stand cold 180° D. 1T., without showing fracture	Same as cold bend		½ in. sectional area	Full size sections will be used so far as possible.			[illegible] cracks, flaws, and defects of all [illegible]	Mfrs. must furnish [illegible] test pieces [illegible] apparatus [illegible] necessary [illegible] make satisfactory tests
					50,000 lbs. 47,000 lbs.	"			"	Bars 1½ in. thick or under to bend 180° D 1T. Bars above 1½ in. thick to bend 130° without sign fracture	All iron must be free from red shortness		No standard given	No standard given	1½ in. thick and over		[illegible] and other mechanical defects	No statement
Baldw[illegible]		[illegible]			48,000 lbs.	"	[illegible]		"	None.	ditto		½ in. sectional area	None	None		Iron to be free [illegible] blisters and cinder spots	At destination
[illegible]		[illegible]			None	.				180° D 2T.	None		None	Full section	Full section		Good finish and free [illegible]	"
[illegible]		None			Not less than 48,000 lbs ditto		[illegible]	[illegible]	Iron will be rejected if it shows a granular fracture covering 5% or more of the surface Fibrous fracture	[illegible] down flat without flaws	Iron must be free from red shortness "	.	No standard given	No standard given	No standard given		[illegible] seams	No statement
[illegible]					50,000 lbs		[illegible]		None	None.	None.		.	.				
[illegible]	[illegible]				50,000 lbs		[illegible]		Fracture must be wholly fibrous	"	Iron must be free from red shortness		½ in. sectional area	"	.		[illegible] ing a good thread with [illegible] rs or other mechanical defects [illegible] welded seams	
					48,000 lbs		[illegible]		Fracture must be fibrous	"	"		"	.	.		ditto	
[illegible]					48,000 lbs.		[illegible]		"	.	"							
[illegible]					Not less than 48,000 lbs		[illegible]		"	180° D 1T			No standard given.				ditto	
[illegible]					48,000 lbs		[illegible]		Fibrous fracture free from crystallization	Iron 1 in. thick and under 180° D 1T " over 1 in. thick 120° without flaw	"		.	"	.		Iron [illegible] be free [illegible] and not vary more than [illegible] ers and cinder spots, and must [illegible] mated wt.	
[illegible]					50,000 lbs		[illegible]		Fracture must be uniformly fibrous	It must stand screw cutting 12 threads per inch screwed into a boiler plate allowed to project ¼ in. through plate. These ends must rivet over to a good full head without cracking or splitting			"				The iron must be free [illegible] taking a thread [illegible] tinal seams, and be capable of working order	
[illegible]					Not less than 48,000 lbs		N[illegible]	[illegible]	Iron will not be accepted if it shows a bad or granular fracture covering more than 50% of the fractured surface	None	None		No standard given				Iron must be [illegible] and free from flaws and seams	

5. The four classes of iron when tested as described in paragraph No. 10 shall conform to the following bending tests:

Cold Bending Test.

(*e*). Refined iron shall bend cold 180° around a diameter equal to twice the thickness of the specimen tested, without fracture on outside of the bent portion.

(*f*). Test iron Class A, shall bend cold 180° around a diameter equal to the thickness of the tested specimen, without fracture on outside of the bent portion.

(*g*). Test iron Class B, shall bend cold 180° flat on itself without fracture on outside of the bent portion.

(*h*). Stay-bolt iron, a piece of stay-bolt iron about 24″ long shall bend in the middle through 180° flat on itself, and then bend in the middle through 180° flat on itself in a plane at a right angle to the former direction, without a fracture on outside of the bent portions. Another specimen with a thread cut over the entire length shall stand this double bending without showing deep cracks in the threads.

6. The four classes of iron when tested as described in paragraph No. 11 shall conform to the following hot bending tests:

Hot Bending Test.

(*i*). Refined iron, shall bend sharply to a right angle, without showing cracks or flaws.

(*j*). Test iron Class A, shall bend through 180° flat on itself, without showing cracks or flaws.

(*k*). Test iron Class B, shall bend through 180° flat on itself, without showing cracks or flaws. A similar specimen heated to a yellow heat and suddenly quenched in water between 80° and 90° F. shall bend, without hammering on the bend, 180° flat on itself without showing cracks or flaws. A similar specimen heated to a bright red heat shall be split at the end and each part bent back through an angle of 180°. It will also be punched and expanded by drifts until a round hole is formed whose diameter is not less than nine-tenths of the diameter of the rod or width of the bar. Any extension of the original split or indications of fracture, cracks, or flaws developed by the above tests will be sufficient cause for the rejection of the lot represented by that rod or bar.

(*l*). Stay-bolt iron, shall bend through 180° flat on itself, without showing cracks or flaws. A similar specimen heated to a yellow heat and suddenly quenched in water between 80° and 90° F. shall bend, without hammering on the bend, 180° flat on itself without showing cracks or flaws.

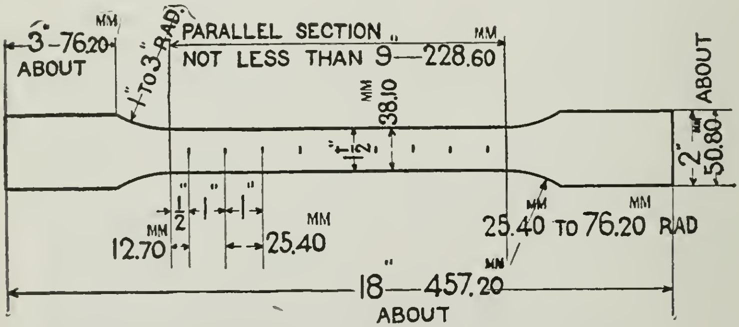
Threading Test.

7. Stay-bolt iron shall permit of the cutting of a clean sharp thread and be rolled true to gauges desired, so as not to jam in the threading dies.

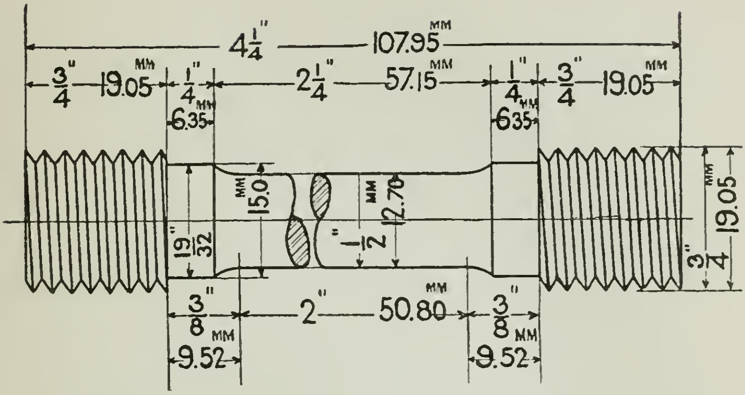
Test Pieces and Methods of Testing.

Test Specimen for Tensile Test.

8. Whenever possible iron shall be tested in full size as rolled, to determine the physical qualities specified in paragraphs Nos. 2 and 3, the elongation being measured on an eight inch (8″) gauged length. In flats and shapes too large to test as rolled, the standard test specimen one and one-half inches (1 1/2″) wide and eight inch (8″) gauged length. In large rounds the standard test specimen of two inch (2″) gauged length shall be used; the center of this specimen shall be half way between the center and outside of the round. Sketches of these two standard test specimens are as follows:



PIECE TO BE OF SAME THICKNESS AS THE PLATE.



Nicking Tests.

9. Nicking tests shall be made on specimens cut from the iron as rolled. The specimen shall be slightly and evenly nicked on one side and bent back at this point through an angle of 180° by a succession of light blows. Tested iron Class B, and stay-bolt iron may be nicked approximately 20 per cent. of its thickness.

Cold Bending Tests.

10. Cold bending tests shall be made on specimens cut from the bar as rolled. The specimen shall be bent through an angle of 180° by pressure or by a succession of light blows.

Hot Bending Tests.

11. Hot bending tests shall be made on specimens cut from the bar as rolled. The specimens, heated to a bright red heat, shall be bent through an angle of 180° by pressure or by a succession of light blows and without hammering directly on the bend.

If desired a similar bar of any of the four classes of iron shall be worked and welded in the ordinary manner without showing signs of red shortness.

Yield Point.

12. The yield point specified in paragraph No. 2 shall be determined by the careful observation of the drop of the beam or halt in the gauge of the testing machine.

FINISH.

13. All wrought iron must be practically straight, smooth, free from cinder spots or injurious flaws, buckles, blisters or cracks.

As the thickness of bars approaches the maximum that the rolls will produce the same perfection of finish will not be required as in thinner ones.

In flat and square bars one thirty-second of an inch (1/32″) variation either way from the size ordered will be allowed.

In round iron one one-hundredth of an inch (1/100″) variation either way from the size ordered will be allowed, except in stay-bolt iron which shall be at least one one-hundredth of an inch (1/100″) and not more than twenty-five thousandths of an inch (25/1000″) below normal size, to insure freedom from jamming in the threading dies.

INSPECTION.

14. The inspector representing the purchaser, shall have all reasonable facilities afforded to him by the manufacturer to satisfy him that the finished material is furnished in accordance with these specifications. All tests and inspections shall be made at the place of manufacture, prior to shipment.

INTERNATIONAL
ASSOCIATION FOR TESTING MATERIALS.

AMERICAN SECTION.

BULLETIN No. 18. MAY, 1900.

REPORT OF COMMITTEE No. 1.

The following report of the American Branch of Committee No. 1 gives the history of its labors in preparing the specifications which are printed in Bulletins Nos. 8-17, together with an outline of the plans for its future work.

The Executive Committee of the American Section at its meeting on April 7, 1900, approved the plan of asking the National Engineering Societies to take up these specifications for discussion. Arrangements [illegible] made for such discussions by the American Society of Civil Engineers at its meeting in New York, on May 16, and by the American Society of Mechanical Engineers, at its meeting in Cincinnati, on May 15-17, 1900. Arrangements are also in progress for their consideration by the American Institute of Mining Engineers, and by other engineering societies.

The Third Annual Meeting of the American Section will be held in New York on October 25-27. Six sessions will probably be held, four of which will be devoted to the detailed discussion of these specifications.

MANSFIELD MERRIMAN,
Chairman of American Section.

RICHARD L. HUMPHREY,
Secretary of American Section.

REPORT OF COMMITTEE No. 1.

PHILADELPHIA, PA., May 1, 1900.

To the Executive Committee of the American Section of the International Association for Testing Materials :

GENTLEMEN.—

We take pleasure in sending you copies of the representative specifications adopted by this Committee, with the following preliminary report showing how the work has been conducted.

Numerous meetings were held, at which the attendance was good, and we take this occasion to thank the members of the Committee for their assistance and hearty coöperation in the work.

On Thursday, March 9, 1899, a meeting for organization was held at the Franklin Institute, Philadelphia. At that time there were only five members of this Committee, and all were present, to wit :—

Carnegie Steel Co., represented by John McLeod.

H. H. Campbell.

Franklin Institute, represented by Dr. Wm. H. Wahl, Secretary.

James Christie.

Wm. R. Webster.

Mr. Wm. R. Webster was elected Chairman and Dr. Wm. H. Wahl, Secretary.

An informal discussion was had as to the manner in which the Committee could most effectively accomplish its work.

On Mr. Christie's motion, duly seconded, the following resolution was adopted.

"*Resolved*, that by virtue of the privilege accorded by the Association, the Committee shall increase its members."

Fifteen additional members were then nominated and approved by unanimous vote. These members were afterwards confirmed by the Executive Committee.

The Franklin Institute assigned the work on this Committee to its Mining and Metallurgical Section, which is represented by the Institute's Secretary, Dr. Wm. H. Wahl, Messrs. James Christie, A. E. Outerbridge, Jr., H. F. J. Porter, Walter Wood, and Wm. R. Webster.

On June 16, 1899, a meeting was held at the same place as before. The Chairman submitted for examination several communications from foreign representatives of Committee No. 1, which were accompanied by printed drafts of data collected.

A general discussion followed as to the manner in which the Committee's work could be most advantageously conducted, the problem given them being as follows :—

"To establish international rules and specifications for testing and inspecting iron and steel (proposed at Zurich Congress, 1895)."

It was decided to divide the material into the following classes, members being appointed on each sub-committee. The name of the Chairman of each is given below.

Sub-committee on Bridge and Ship Material, J. A. L. Waddell, Chairman.

Sub-committee on Building Material, James Christie, Chairman.

Sub-committee on Rails, Wm. R. Webster, Chairman.

Sub-committee on Boiler Materials, H. V. Wille, Chairman.

Sub-committee on Axles, Carnegie Steel Co., (J. McLeod), Chairman.

Sub-committee on Tires, etc., H. V. Wille, Chairman.

Sub-committee on Forgings, Bethlehem Steel Co., Chairman.

Sub-committee on Steel Castings, James Christie, Chairman.

Sub-committee on Wire, Cambria Steel Co., (Geo. Thackray), Chairman.

In order to collect the specifications in use for the different classes of material, it was decided to send out a circular letter to the leading engineers, railroad companies, and manufacturers, requesting copies of their specifications for the use of the Committee. This was done in due course and met with prompt replies, giving us *all the specifications on which our work is based.*

A meeting was held in Pittsburg on August 15, 1899, at which reports were received from the sub-committees on each class of material, and after a general discussion it was suggested that the Chairman of each sub-committee should prepare a series of questions embracing all desired information on his subject, and that lists be sent to each member of the sub-committee for comments and opinion. As such successful results had already been obtained in this manner by Mr. James Christie from his list of questions on Building Materials, the same course was pursued by the Chairman of each sub-committee with correspondingly satisfactory results.

On November 17th and 18th the Committee met in Philadelphia at the Franklin Institute and the Engineers' Club.

The Chairmen of sub-committees read the replies they had received to the questions sent out, and each specification was discussed in detail. Mr. Christie acted as Chairman of sub-committee on Bridge Material, at the request of Mr Waddell.

A special committee, consisting of the Chairmen of the sub-committees, was appointed to facilitate the compilation of reports of the sub-committees in cases where, for any reason, they might be dilatory.

On December 5, 1899, a meeting of the special committee was held at the house of the American Society of Mechanical Engineers, New York City, at which the specifications were again taken up in detail, item by item, and discussed.

The Chairman of each sub-committee was requested to get his specifications in definite shape in order that they could be acted upon by the general committee.

On December 14th and 15th, meetings were held at the Engineers' Club of Philadelphia, when all specifications were again taken up in detail, and on motion of Mr. Christie those specifications relating to subjects not then in definite shape for presentation (but which had been settled in substance by the Committee), should be completed by the Chairman of the respective sub-committees, as soon as possible and submitted to the Chairman of the special committee for distribution among the members of Committee No. 1.

This was done and on December 18th, the specifications were sent to all the members of Committee No. 1, and their replies asked for by January 10, 1900, their attention being called to the following resolution of June 16th.

"Mr. John McLeod moved that on a proposition to adopt a specification, a copy of same shall be sent to every member, and that the votes of absent members be taken by letter ballot. Also, that every formal action by the Committee shall be confirmed by vote of a majority of the Committee, taken by letter ballot. Duly seconded and adopted."

On January 19 and 20, 1900, meetings were held at the Engineers' Club of Philadelphia, at which letters were read from members, giving their views on the rough draft of the specifications that had been sent out, whereupon each specification was taken up in detail and discussed. This resulted in several changes being made. It was also found necessary to arrange for placing the work that had thus far been done, in more permanent shape for reference and discussion. The following sub-committees were appointed to do this work, as per the following schedule :—

1st. To edit all the specifications in the same general form. Sub-committee : Messrs Colby and Thackray.

2nd. To prepare for each class of material, a tabulated summary of the specifications in use, and on which the work of Committee No. 1 is based. Sub-committee : Messrs. McLeod and Carhart.

3rd. To report on methods of testing. Sub-committee : Messrs. Christie and Webster.

The Committee then adjourned to meet as soon as the sub-committees were ready to report.

On March 23rd and 24th, meetings were again held at the Engineers' Club of Philadelphia.

The specifications and tabulated work were in very satisfactory shape. The same course was followed as at the previous meeting, each specification being taken up in detail and discussed. A few minor changes were made, after which it was decided to have all the specifications and tables printed. Each specification is complete in itself and is printed separately with the table giving a summary of corresponding specifications attached. (Members were requested to send in any specifications they thought should be added to these tables).

The specifications were sent to each member of this Committee on April 10 for his views on the same to be expressed in the form of a vote by letter ballot. The only question submitted to vote was the following :

"Are these proposed specifications fair representative specifications of the best American practice and specifications in use in this country ?

"It should be further understood that these specifications will come up for general discussion at the annual meeting of this Association in October next, after which they will be referred back to this committee to make any changes that are found necessary."

The result of the vote was that each of the following specifications was adopted :

Specifications for Structural Steel for Bridges and Ships	Bulletin No. 8.
Specifications for Structural Steel for Buildings	Bulletin No. 9.
Specifications for O. H. Boiler Plate and Rivet Steel	Bulletin No. 10.
Specifications for Rails	Bulletin No. 11.
Specifications for Splice Bars	Bulletin No. 12.
Specifications for Steel Axles	Bulletin No. 13.
Specifications for Steel Tires	Bulletin No. 14.
Specifications for Steel Forgings	Bulletin No. 15.
Specifications for Steel Castings	Bulletin No. 16.
Specifications for Wrought Iron	Bulletin No. 17.

The next step will be to send these specifications to all the members of the American Section and the leading engineers of this country, for the purpose of having a full discussion of the same at the Autumn meeting of this Association. It is of the utmost importance that the views of all parties be secured at that time, as it will be the final discussion, and time enough will be allowed for the discussion of each subject.

After the Autumn meeting, Committee No. 1 will consider the points raised in discussions, and make changes if they should be found necessary. Then the specifications may be sent to all members of the American Section for approval by letter ballot.

In following the course outlined above, a full opportunity will be given every member to discuss each specification in writing and at the meeting, before they come up for the final action. This course should enable the Committee to agree upon a body of representative specifications that will be fair both to the manufacturer and the consumer, and that will come into general use in this country.

At the meeting of January 19, 1900, a letter from Mr. A. Rieppel, Chairman of the International Committee No. 1, was read, with printed forms for recording specifications. The Chairman stated that he had sent, in reply to this, a letter stating that the American Branch of Committee No. 1 was covering the same ground in detail, and would soon be in a position to send him a preliminary report of its work, after consulting which he was requested to advise this Committee whether he still desired to have his blanks filled out.

In this report we have endeavored to give a concise statement of the manner of carrying on the work of this Committee, and to show that all its work is based on the existing specifications and best practice in use to-day; also, that these proposed specifications are offered as the best means for the introduction of International Specifications and Methods of Testing. We feel confident that if the other countries will follow the same general course and prepare similar specifications, the final work will be very much simplified, and International Specifications for general use can be arrived at.

There is no doubt that this will be done, especially as Mr. Rieppel in his instructions states:—

"The materials of iron and steel are to be treated in the following succession:

1. Materials for superconstructions of railways.
2. Materials for locomotives and carriages.
3. Materials for the construction of ships.
4. Boiler plates and sheets.
5. Rolled and cast iron tubes."

This is practically the same division as that adopted by our Committee, except in the matter of rolled and cast iron pipe, which we will take up later. In all other cases, we have gone into the matters a little more in detail.

The By-laws and List of Members of the International Association for Testing Materials (June 1899) show that 13 countries are represented on Committee No. 1, which indicates the importance of this work.

It has been the endeavor of this Committee (which has been increased from time to time, and now numbers 34 members, a complete list of which is sent herewith), to give a full synopsis of the specifications in use for each class of material, and to put matters in the most convenient shape for discussion, and we hope that our engineers will take these specifications up in the spirit in which they are offered.

What we really want to know is, are these fair representatives of specifications in use in this country, and the best American practice? If not, then what modifications are required, to make them so?

Respectfully submitted,

For the American Branch of International Committee No. 1,

WM. R. WEBSTER, Chairman.
WM. H. WAHL, Secretary.

MEMBERS OF THE AMERICAN BRANCH OF COMMITTEE No. 1 OF THE INTERNATIONAL ASSOCIATION FOR TESTING MATERIALS.

Wm. R. Webster, Consulting and Inspecting Engineer, 411 Walnut Street, Philadelphia.

Franklin Institute, Dr. Wm. H. Wahl, Secretary, Philadelphia, Pa.

Chas. L. Huston, Vice-President, Lukens Iron and Steel Company, Coatesville, Pa.

H. H. Campbell, Superintendent, Pennsylvania Steel Company, Steelton, Pa.

Cambria Steel Company, Chas. S. Price, General Manager; Geo. E. Thackray, Engineer, Johnstown, Pa.

Carnegie Steel Company, Ltd., John McLeod, Engineer of Tests, Pittsburg, Pa.

P. E. Carhart, Inspecting and Testing Engineer, Illinois Steel Company, Chicago, Ill.

Jones & Laughlins, Ltd., W. L. King, General Manager, Pittsburg, Pa.

Bethlehem Steel Company, A. L. Colby, Metallurgical Engineer, South Bethlehem, Pa.; Maunsel White, Engineer of Tests.

James Christie, Chief Mechanical Engineer, Pencoyd Iron Works, Pencoyd, Pa.

John Sterling Deans, Bridge Engineer, Phoenix Bridge Company, Phoenixville, Pa.

H. V. Wille, M.E., Engineer of Tests, Baldwin Locomotive Works, Philadelphia, Pa.

Frank C. Osborn, C.E., The Osborn Company, Civil Engineers, Cleveland, Ohio.

Robert W. Hunt & Company, Inspecting and Testing Engineers, Chicago, Ill.

J. A. L. Waddell, Civil and Consulting Engineer, Kansas City, Mo.

Henry B. Seaman, Civil and Consulting Engineer, 40 Wall Street, New York, N. Y.

Wm. H. Burr, Professor of Civil Engineering, Columbia University, New York, N. Y.

John B. Johnson, Dean of College of Mechanics and Engineering, University of Wisconsin, Madison, Wis.

G. M. McCauley, General Manager, Central Iron and Steel Company, Harrisburg, Pa.

Colorado Fuel and Iron Company, J. A. Kebler, General Manager, Denver, Colo.

A. A. Stevenson, M.E., Engineer, Standard Steel Works, Burnham, Pa.

Frederick H. Daniels, Chief Engineer, American Steel and Wire Company, Worcester, Mass.

David Thomas, Assistant Superintendent, Reading Iron Company, Danville, Pa.

Chas. S. Churchill, Engineer, Maintenance of Way, Norfolk and Western Railway Company, Roanoke, Va.

Samuel Tobias Wagner, C.E., First Assistant Engineer, City of Philadelphia, City Hall, Philadelphia, Pa.

J. Allen Colby, Inspecting Engineer, Witherspoon Building, Philadelphia, Pa.

Joseph T. Richards, Engineer, Maintenance of Way, Pennsylvania Railroad, Broad Street Station, Philadelphia, Pa.

Max H. Wickhorst, Engineer of Tests, Chicago, Burlington and Quincy Railroad, Aurora, Ill.

Edgar Marburg, Professor of Civil Engineering, University of Pennsylvania, Philadelphia, Pa.

J. A. Janeway, Mechanical Engineer, J. A. Roebling's Sons Company, Trenton, N. J.

Walter Wood, R. D. Wood & Company, 400 Chestnut Street, Philadelphia, Pa.

Arthur Brock, President of American Iron and Steel Manufacturing Company, Lebanon, Pa.

Shelby Tube Company, A. G. Morse, Superintendent, Shelby, Ohio.

National Tube Company, Conestoga Building, Pittsburg, Pa.

INTERNATIONAL ASSOCIATION FOR TESTING MATERIALS.

AMERICAN SECTION.

BULLETIN No. 19. SEPTEMBER, 1900.

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PROGRAM FOR THE THIRD ANNUAL MEETING OF THE AMERICAN SECTION.

The Third Annual Meeting will be held in New York, N. Y., on Thursday, Friday, and Saturday, October 25, 26, and 27, 1900. The sessions will be held at the House of the American Society of Mechanical Engineers, 12 West Thirty-first Street, beginning at 3 P.M. on October 25.

OCTOBER 25, 3 P.M.

1. Remarks by the Chairman.
2. Report of the Secretary.
3. Report of the Treasurer.
4. Report of the Publication Committee.
5. Report of the Executive Committee regarding the increase of membership of Committee No. 1.
6. Report of the Executive Committee regarding the representation of the American Section on the International Council.

7. Proposed amendments to the By-Laws.

8. Election of officers for 1900–1902.

[A blank ballot is sent with this Bulletin to all members ; this may be forwarded by mail to the Secretary or be voted at the meeting. The ballot will close at 4.30 P.M.]

9. Miscellaneous business.

OCTOBER 25, 6.30 P.M.

10. Informal dinner.

OCTOBER 25, 8.30 P.M.

11. Report of Committee No. 1.

12. Discussion of the Specifications for Structural Steel for Buildings, Structural Steel for Bridges and Ships, and Open-hearth Boiler Plate and Rivet Steel recommended by the American Branch of Committee No. 1.

[These Specifications are printed in Bulletins Nos. 8, 9, and 10.]

13. Miscellaneous Business.

OCTOBER 26, 10 A.M.

14. Reports of Committees Nos. 2, 3, 4, 5, and 6.

15. Discussion of the Specifications for Steel Rails and Steel Splice Bars recommended by the American Branch of Committee No. 1.

[These Specifications are printed in Bulletins Nos. 11 and 12.]

16. Miscellaneous Business.

OCTOBER 26, 3 P.M.

17 Reports of Committees Nos. 7, 8, 9, 10, 11, 12, 13, 14, 15, and 16.

18. Discussion of the Specifications for Steel Axles, Steel Tires, and Steel Forgings recommended by the American Branch of Committee No. 1.

[These Specifications are printed in Bulletins Nos. 13, 14, and 15.]

19. Miscellaneous Business.

OCTOBER 27, 8.30 P.M.

20. Reports of Committees, Nos. 17, 18, 19 20, and 22.

21. Discussion of the Specifications for Steel Castings and

Wrought Iron recommended by the American Branch of Committee No. 1.

[These Specifications are printed in Bulletins Nos. 16 and 17.]

22. Miscellaneous Business.

OCTOBER 28, 10 A.M.

23. Report of the American Committee on Impact Tests.

24. Report of the American Committee on Basic and Acid Open-hearth Steel.

25. Report of the American Committee on Proper Heat Treatment for Iron and Steel.

26. Report of the American Committee on the Relation between Chemical Composition and Physical Properties of Iron and Steel.

27. Report of the American Committee on the Electrical Testing of Metals.

28. Unfinished Business.

QUARTERLY MEETING OF THE EXECUTIVE COMMITTEE, APRIL 7, 1900.

The regular quarterly meeting of the Executive Committee was held at the House of the American Society of Mechanical Engineers, 12 West 31st Street, New York, on Saturday, April 7. The meeting was called to order at 2.35 P.M. Present: Messrs. Merriman, Howe, Humphrey, and Henning. A letter was read from Mr. Kreuzpointner, stating that illness prevented his attendance.

REPORT OF THE SECRETARY.

The Secretary presented the following financial statement for the quarter ending March 31, 1900.

Receipts:		
Dues for 1899	$ 8.50	
Dues for 1900	265.00	
Excess dues	1.00	
		$274.50
Paid to Treasurer		$274.50

He also reported that 5 members had withdrawn and 11 new members had been added during the quarter, making the total membership 146. Eight members were in arrears for dues for 1899, and 32 were in arrears for 1900. On motion the Secretary was instructed to notify all delinquents of 1899 of their arrearages, and to ask them if they desired to continue their membership.

GENERAL FUND.

The following report of the General Fund for the quarter ending March 31, 1900, was received from the Treasurer:

	Receipts:		
Jan. 3.	Balance on hand	$ 49.15	
Jan. 7.	From International Association for 1899	1.80	
Mar. 31.	From Secretary	$274.50	
			$325.45
	Expenditures:		
Jan. 7.	International Association for 1899	19.50	
Jan. 15.	1000 membership blanks	6.50	
Feb. 16.	International list of members	7.75	
Mar. 31.	Excess dues repaid	1.00	
Mar. 31.	Secretary's expenses, 1900	13.65	
Mar. 31.	Balance on hand	277.05	
			325.45

PUBLICATION AND RESEARCH FUND.

The Treasurer reported the recipt of a contribution of $50.00 from the Illinois Steel Company, and on motion the thanks of the Executive Committee were expressed for the gift. The following is a statement of this fund for the quarter ending March 30, 1900:

	Receipts:			
Jan. 1.	Balance on hand		$565.35	
Feb. 26.	Illinois Steel Company		50.00	
				$615.35
	Expenditures:			
Jan. 9.	Committee No. 1	$39.26		
Feb. 16.	Bulletin No. 7	12.40		
			$ 51.66	
	Balance on hand, April 1, 1900		563.69	
				$615.35

REPORT OF PUBLICATION COMMITTEE.

The Chairman reported for the Publication Committee that

Bulletin No. 7 was printed in January and that six pages had been printed for insertion in the International List of Members, both being distributed to members on Feb. 1. Ten sets of Specifications had been received from Committee No. 1, which had been put in the hands of the printer and would probably be distributed to members during the first week in May.

Committee No. 1.

A letter was read from Mr. William R. Webster, Chairman of the American members of Committee No. 1, saying that the following members had been added to that Committee in pursuance of the resolution adopted by the Executive Committee on Jan. 6, 1900; Charles S. Churchill, J. Allen Colby, Edgar Marburg, Joseph T. Richards, and Samuel Tobias Wagner. He also requested that Arthur Brock, David Thomas, and Walter Wood be appointed as additional members. On motion, these appointments were made, subject to the action of the International Council.

The Chairman read a letter from President Tetmajer saying that the subject of the increase of membership in the American branch of Committee No. 1 would be considered at the next meeting of the International Council. The Secretary was instructed to forward to him a list of the American members of that Committee.

A circular letter from the Chairman of Committee No. 1 to the members of that committee regarding the final vote on specifications was read; it announced that the subject would be ready for discussion at the Third Annual Meeting. It was also announced that the committee desired to bring the specifications up for discussion before the National Engineering Societies, and, on motion, the plan was approved.

The Publication Committee was authorized to print a larger edition than usual of the Bulletins containing the report and specifications of Committee No. 1.

Committee on Impact.

A bill for 100 marks was presented by the Chairman of the American Committee on Impact Tests, this expense being incurred in the collection of references to German literature. On motion the bill was referred to the Chairman and Secretary to obtain further information.

COMMITTEE NO. 3.

This Committee requested the Executive Committee to defray the expense of translating certain German manuscripts relating to its technical work. After discussion it was thought best not to grant the request, but the Secretary offered to obtain a translation without expense.

TRANSFERS OF MEMBERSHIP.

The Secretary reported that the Shoenberger Steel Company desired to transfer its membership to the American Steel and Wire Company, and that Robert S. Hale desired to transfer his membership to the Mutual Boiler Insurance Company. After discussion the following rule relating to such cases was adopted: *Resolved*, that transfers of membership from a firm to its lessee, from a firm to one of its officers, and from an officer of a firm to that firm may be allowed, provided, that the party to which the transfer is made shall fill out and file with the Secretary a membership blank.

INTERNATIONAL ACCOUNTS.

The Chairman read a letter from President Tetmajer approving Rule 5, adopted by the Executive Committee on Oct. 21, 1899. It was voted that the Treasurer, in making his next remittance to the International Association, be instructed to deduct three-fifths of the general expenses of the Secretary's office from the total sum due. The amounts to be deducted were stated by the Secretary as $10.41 for 1899, and $8.19 for the first quarter of 1900.

The Chairman read a letter from President Tetmajer, dated Feb. 19, 1900, relative to the manner in which the Treasurer should transmit funds to the International Association, the letter stating that the method in which this should be done was entirely an internal affair of the American Section. After discussion, it was voted that the Treasurer be instructed to remit directly to President Tetmajer by money order $1.50 for each member whose dues have been paid, minus three-fifths of the general expenses of the American Section, and also to furnish him with the names of the members paying said dues.

ADVISORY COUNSELORS.

The Chairman read a letter from President Tetmajer saying that the American Section has no Advisory Counselors, as these officers are appointed only for countries which have no members on the Council. Mr. Henning explained that when these officers were appointed on June 15, 1898, he was in doubt regarding the matter, but deemed it best to provide for every contingency. After discussion, it was resolved that the names of the two Advisory Counselors for the American Section be omitted in future lists.

COUNCIL MEETING.

Mr. Henning said that he had been instructed to present to the Executive Committee a program of the International Council meeting to be held at Zurich on April 23, 1900. Three matters of special interest to the American Section would be considered: (1) The request of Mr. Henning that his provisional appointment as American Member of Council be continued until the next congress of the Association. (2) The petition of 34 American members that Professor Howe be appointed Member of Council, and that certain changes be made in the conduct of business matters. (3) The increase in the American membership of Committee No. 1.

AMERICAN MEMBER OF COUNCIL.

The Chairman presented correspondence regarding the representation of the American Section on the International Council: (1) a letter from President Tetmajer dated June 17, 1899, asking how the American members of the Association would like to settle the representation of America in the Council until the Paris Congress; (2) a letter from President Tetmajer, dated Feb. 19, 1900, saying that, as no Congress of the Association is held this year, Mr. Henning had made the request that his functions may continue, and asking if the American Section agrees to said request; (3) a petition of 39 members of the American Section, dated February, 1900, asking the Chairman to appoint, or procure the appointment of, an American member of Council in place of Mr. Henning, and also asking for certain changes in the conduct of business between the International Council and the American Section ; (4) a letter of the Chairman to the International Council, dated Feb. 23, 1900, making four recommendations ; (5) letters from President Tetmajer, dated March 7 and 14, 1900, requesting more formal action on the question of the representation of the American Section on the International Council.

The following are the recommendations made by Chairman Merriman to the International Council under date of Feb. 23, 1900, Vice-Chairman Howe concurring in the second, third, and fourth resolutions, and Secretary Humphrey and Treasurer Kreuzpointner concurring in all :

1. That Professor Henry M. Howe be appointed as the American Member of Council until the next Congress of the Association.

2. That our Executive Committee shall have power, whenever our member of Council cannot attend a Council meeting, to designate a substitute to act in his place for that meeting.

3. That notices of all Council meetings, with a statement of business to be discussed, be sent to each member of our Executive Committee, in order that instructions may be given to our Representative ; also that copies of the minutes of the Council meetings be sent to each member of our Executive Committee.

4. That all financial business between the Council and the American members be transacted through the Treasurer of the American Section ; also, that other routine business matters be transacted through the Secretary of the American Section.

After a lengthly discussion the following preamble and resolutions were adopted, Mr. Henning alone objecting.

WHEREAS, the Chairman of the American Section with the approval of a majority of the members of the Executive Committee submitted, on February 23, 1900, the above recommendations to the International Council.

Resolved, that this Executive Committee hereby formally endorses and approves said recommendations and requests the careful consideration of the same by the International Council.

The Secretary was instructed to immediately notify the International Council of this formal action. He was also instructed to say that, in accordance with President Tetmajer's letter of March 14, 1900, this action of the Executive Committee appoints Professor Henry M. Howe as the American Member of Council until his successor is designated by the American Section.

THIRD ANNUAL MEETING.

It was resolved that the Third Annual Meeting of the American Section be held in New York City on Oct. 25–27, 1900, beginning at 3 P.M. on Oct. 25.

REPORTS FOR APRIL–JUNE, 1900.

No meeting of the Executive Committee was held in July, but the Secretary and Treasurer reported to the Chairman the following financial statements for the quarter ending June 30, 1900.

REPORT OF THE SECRETARY.

Received dues from members	$ 52.50
Paid to the Treasurer	52.50

REPORT OF THE TREASURER.

General Fund.

March 31, 1900.	Balance on hand		$ 277.05
April 10, 1900.	From International Association for 1899		10.41
April 10, 1900.	From International Associatson for 1900		8.19
June 30, 1900.	From Secretary		52.50
			$348.15
April 10, 1900.	To International Association for 1900	$ 163.50	
June 30, 1900.	Secretary's expenses	1.00	
June 30, 1900.	Treasurer's expenses	1.80	
June 30, 1900.	Balance on hand	181.85	
			$ 348.15

Publication and Research Fund.

March 31, 1900.	Balance on hand	$ 563.69
June 30, 1900.	Balance on hand	563.69

CORRESPONDENCE RELATING TO THE REPRESENTATION OF THE AMERICAN SECTION ON THE INTERNATIONAL COUNCIL.

A.

President Tetmajer to Chairman Merriman,

June 17, 1899.

Meeting a short time ago at Paris the Council showed great interest in the organization and activity of the American Section of the International Association as seen in the pamphlet (History, Laws, Committees, and List of Members) you were kind enough to send some time before.

This gave occasion to discuss the representation of America in the Council of the International Association. Captain Carter, who was appointed American Member of the Council at the Congress of Stockholm, had not answered numerous letters and circulars addressed to him. We were, therefore, obliged to appoint a person willing to undertake the affairs of the International Association in the United States. Accordingly the Council decided at a meeting which took place on the 16th and 17th of January of last year to entrust the American affairs of the Council *pro tem.* to Mr. Henning of New York until the Paris Congress. This office was readily undertaken by Mr. Henning.

The pamphlet mentioned above serves to show the firm and independent organization formed by the American members of the International Association. On account of this changed situation the Council instructed us to ask you, as Chairman of the American Section, how the American members of the Association would like to settle the representation of America in the Council until the Paris Congress. The Council thought it their duty to call your attention to this matter, as they wish to do all in their power to oblige the American members.

B.

Chairman Merriman to President Tetmajer,

July 3, 1899.

In reply to your letter of June 17, I beg to say that, in my opinion, no change in the American representation on the International Council is desirable until the Paris Congress. It would, however, simplify matters if all financial business could be transacted through our Treasurer, Mr. Kreuzpointner.

C.

CHAIRMAN MERRIMAN TO PRESIDENT TETMAJER,

FEBRUARY 5, 1900.

At the next meeting of our Executive Committee a rule will be proposed instructing our Treasurer to transmit to you, or to Secretary Zschokke, $1.50 for each member who has paid his dues for 1900. Heretofore our Treasurer has made these payments to Mr. Henning, but it would simplify matters if hereafter the money could be transmitted directly to you.

Will you kindly inform me if such action meets with your approval?

D.

PRESIDENT TETMAJER TO CHAIRMAN MERRIMAN,

FEBRUARY 19, 1900.

As for the manner of sending the subscriptions of the American members we believe this to be an internal affair of the American Section. If you consider it more to the point to have the subscriptions transmitted directly by Mr. Kreuzpointner, we agree with you perfectly.

We conclude with an inquiry concerning the American representation on the Council. According to a former decision of of the Council, Mr. Henning has been entrusted provisionally and until the Paris Congress with the direction of affairs of the Council in the United States instead of Mr. Carter. But as the Paris Congress is not organized by the International Association, Mr. Henning requests us to change this decision so that his functions may continue until the next Congress of the International Association.

This affair can only be decided by the Council, but before we submit the same to the Council, we should be glad, if you were to inform us, if the American Section agrees to having Mr. Henning as their representative in the Council of the International Association until the next Congress organized by the International Association.

E.

PETITION OF 39 MEMBERS TO CHAIRMAN MERRIMAN, FEBRUARY, 1900.

The following members of the Association respectfully call your attention to the desirability of making a change in our present representation on the International Council, especially as our present representative is only provisionally appointed. We would call your attention to the following extracts from a communication from the International Association addressed to you on this subject under date of June 17th, 1899: [See above, A.]

We therefore respectfully request that you shall appoint, or procure the appointment of, an American member of the International Council, who will be in hearty sympathy with our work, and will be competent to represent our interests in the foreign Conferences.

We would further ask that when a meeting is to be called of the International Council, that a notice of the meeting and business coming up be sent our Executive Committee as far in advance of such meeting as possible, in order that our representative might receive instructions what action to take. If this notice of business cannot be sent, we would ask that the action of our representative at any meeting may not be considered final until it has been submitted to our Executive Committee for approval.

As regards the financial matters with the International Association, we would further request that the Treasurer of the American Section attend to that part of the business; and, further, in any ordinary routine business, that as far as possible it be transacted through our Secretary, our object being to have all communications on record.

We feel it advisable at this time to put matters on a good working basis for the future, and we will do everything on our part to cooperate with the Association in carrying out the work before us.

Yours truly,

Gwilliam Aersten, J. W. Anderson, Bethlehem Iron Company, Jos. W. Bramwell, William Brown, Cambria Iron Company, H. H. Campbell, P. E. Carhart, Carnegie Steel Company, James Christie, J. Allen Colby, Albert Ladd Colby, Frederick H. Daniels, John Sterling Deans, Stanley G. Flagg, George T. Gwilliam, Henry M. Howe, Richard L. Humphrey, Robt. W. Hunt & Company, Charles L. Huston, Jones & Laughlins, Ltd., Frank G. Kennedy, Jr., Latrobe Steel Company, Robert W. Lesley, Edgar Marburg, G. M. McCauley, Richard K. Meade, James M. Merritt, Frank C. Osborn, Tinius Olsen, James M. Porter, M. Rothberg, P. W. Shimer, A. A. Stevenson, Geo. E. Thackray, David Thomas, William R. Webster, Thomas D. West, H. V. Wille.

F.

CHAIRMAN MERRIMAN TO THE INTERNATIONAL COUNCIL.

FEBRUARY 23, 1900.

Referring to the representation of this country on the International Council, concerning which you kindly addressed me a letter on June 17, 1899, I beg to say that many of our members desire a change in the same. A petition, signed by 34 members, has recently been received by me, and a copy of the same is herewith enclosed. After carefully considering the matter, I have concluded that the interests of the Association will be promoted by a change in our representation on the Council and by modifications in the method of transacting business with the American Section. Accordingly, I beg leave to respectfully submit the following recommendations :

1. I recommend that Professor Henry M. Howe be appointed as the American member of Council until the next congress of the Association.

2. I recommend that our Executive Committee shall have power, whenever our member of Council can not attend a Council meeting, to designate a substitute to act in his place for that meeting.

3. I recommend that notices of all Council meetings, with a statement of business to be discussed, be sent to each member of our Executive Committee, in order that instructions may be given to our representative. Also that copies of the minutes of the Council meetings be sent to each member of our Executive Committee.

4. I recommend that all financial business between the council and the American members be transacted through the Treasurer of the American Section. Also, that other routine business matters be transacted through the Secretary of the American Section.

G.

PRESIDENT TETMAJER TO CHAIRMAN MERRIMAN,

MARCH 14, 1900.

We haste to inform you that Mr. Henning has requested us to allow him to retain his office as Member of Council until the next Congress of the International Association; at the same time we have your recommendation, as well as the recommendation of 34 American Members, to appoint Prof. Howe as the American member of Council in place of Mr. Henning.

After having carefully considered the matter we come to the conclusion:

According to the old (at the present moment legal) statutes, Members of Council can only be appointed by the Congress, and the Council has in reality not the right to appoint its own members. But as the next Congress will not take place for some time to come and as on the other hand the present statutes have not provided for a case similar to the one before us, we are obliged to do the best we can.

At the last Council meeting in Dresden (25th and 26th Sept., 1899) a new draft of statutes was submitted to the Council but not definitely accepted. These new statutes decide that the representative of each country shall be elected by the members of the Association of the respective land; either he is to be appointed by the members themselves or, at least, proposed by them to the Congress.

This seems to be the only natural settlement of the present case and we request you, according to the above explanation, to cause the appointment of the representative by the American Section, by vote, or in any other way you consider suitable.

We request you to submit the result of the votes in the name of the American Section to the Council, and at the same time also your other recommendations regarding the transaction of business with the American Section, giving them in the form of a detailed definite proposal by order of the American Section to be laid before the Council.

We beg to state that yesterday we wrote to Mr. Henning telling him to arrange himself the whole affair with the American Section for the present.

H.

SECRETARY HUMPHREY TO THE INTERNATIONAL COUNCIL,

APRIL 9, 1900.

At the regular quarterly meeting of the Executive Committee of the American Section, held in New York on Saturday, April 7, 1900, the following resolutions were adopted :

WHEREAS, The Chairman of the American Section, Professor Mansfield Merriman, on February 23, 1900, with the approval of a majority of the members of the Executive Committee, submitted the following recommendations to the International Council :

1. [See above under F, or below under L]
2. " " "
3. " " "
4. " " "

"*Resolved*, That this Executive Committee hereby formally endorses and approves the above recommendations, and requests careful consideration of the same by the International Council."

In accordance with the above action, you are hereby notified that Professor Henry M. Howe is the Official Representative of the American Section of the International Association for Testing Materials until his successor is appointed by the American Section. Respectfully submitted in the name of the American Section.

J.

CHAIRMAN MERRIMAN TO PRESIDENT TETMAJER,

MAY 18, 1900.

I have as yet received no word regarding the action of the International Council, at its meeting on April 23, concerning the affairs of the American Section. Will you kindly furnish me with a statement of the conclusions of the Council in order that I may communicate them to the American members.

[No reply was received until July 27, 1900, when President Tetmajer's letter of July 9, 1900, came to hand. See L below.]

K.

CHAIRMAN MERRIMAN TO REPRESENTATIVE HOWE,

JUNE 12, 1900.

This is to certify that action was taken by the Executive Committee of the American Section on April 7, 1900, whereby you were authorized to represent the American Section in all its relations with the International Council. No other person has any authority to act for the American Section in this connection.

You are therefore requested to communicate the wishes of the American Section to the members of the International Council and to attend such meetings of the same as may be held during your stay in Europe.

[A similar certificate was also addressed to the International Council and forwarded to President Tetmajer on June 12, 1900.]

L.

PRESIDENT TETMAJER TO CHAIRMAN MERRIMAN,

JULY 9, 1900.

Among the transactions of the 23d and 24th of April, 1900, the Council of the International Association for Testing Materials submitted two proposals for discussion :

I. Mr. Henning's petition of the 5th of February, 1900, concerning his term of office as Member of Council until the next Congress of the Association.

II. The following resolutions of the Executive Committee of the American Section of April 7, 1900 :

1. That Prof. Henry M. Howe be appointed as the American Member of Council until the next Congress of the Association.

2. That our Executive Committee shall have power, whenever our Member of Council cannot attend a Council meeting, to designate a substitute to act in his place for that meeting.

3. That notices of all Council meetings, with a statement of

business to be discussed be sent to each member of our Executive Committee, in order that instructions may be given to our representative. Also, that copies of the minutes of the Council meetings be sent to each member of our Executive Committee.

4. That all financial business between the Council and the American members be transacted through the Treasurer of the American Section. Also that other routine business matters be transacted through the Secretary of the American Section.

The Council has discussed these petitions at full length and decided to acquaint you with the resolutions adopted by sending you an extract of the Minutes of Proceedings of the seventh meeting of Council.

EXTRACT.

I. Prof. Martens is of the opinion that first of all it is to be stated in the Minutes of Proceedings how Mr. Henning's election took place. This resolution is adopted and it is resolved to enter the following on the Minutes of Proceedings:

At the Stockholm Congress, Mr. Henning was elected Member of Council by a majority of votes. It was on account of Mr. Henning's especial wish that Captain Carter was finally elected. The latter being prevented from fulfilling the duties of his office, the Council, according to a resolution of the 16th of January, 1898, requested Mr. Henning to take his place until the next Congress of the International Association which was expected to be held at Paris. At the Council meeting in Paris, Mr. Henning's election was once more discussed and it was resolved to obtain the consent of the American Section which was done by letter of the 3rd VII, 1899. The Council, therefore regards Mr. Henning as regularly elected until the next Congress of the International Association, and declares that a member of Council can only lose his office by death, by erasure of his name from the list of members of the Association, or by resignation of his office.

II. To Clause 1 it is resolved as moved by Prof. Martens: The Council states its members are elected, according to the still valid statutes, by the Congress. Therefore the Council can not permit that a corporation, even if it is a member of the Association, has the right of electing a representative on the Council as long as the statutes have not been changed.

To Clause 2 the Council decides: That according to another similar case, representation at Council meetings was admissible, but this representative would only have a consulting voice.

To Clause 3: The Council decides, on the President's motion, to pass it over because else other Sections might make the same demands, and business transactions would be more difficult than ever.

Clause 4: This clause is rejected, as moved by the President, giving as a reason that, according to the regulations of Council, money matters as well as all the rest of the business transactions between the Central office and foreign countries had to be managed through the members of Council, respectively the representatives.

As resolved by the Council, the four above-mentioned resolutions are to be brought to the notice of the Chairman of the American Section, Mr. Mansfield Merriman, through Mr. Henning, Member of Council, and the letter containing these resolutions was to be signed by the Executive Committee.

Questioned by Mr. Martens Mr. Henning explains that the four resolutions of the American Section were not adopted in full meeting, but only by the Executive Committee and only by an uncertain proportion of votes.

As for Clause I and II, we take the liberty of adding a few remarks: It is a matter of course that the wishes of the members of the Association of each country must be taken into account before anything else. Section 8 of the present statutes says that members of Council are to be elected until the next Congress. It is, therefore, according to the statutes, not permitted to substitute another member during the term of office of the first.

The resolutions of Clause II_3 and II_4, were dictated to the Council by purely practical considerations, as it is not possible, taking the extensive correspondence and business transactions with the Members of Council and Representatives into account, to correspond with more than one person in each country, officially. The American members of the Association are, therefore, advised to employ the services of their Member of Council in all transactions relating to the Association, including the financial arrangements, as is done in all other countries.

M.

REPRESENTATIVE HOWE TO SECRETARY ZSCHOKKE,

JULY 20, 1900.

According to your request I will now try to outline the headings of the remarks which I made to you on July 17, with the view of explaining to you and through you to President Tetmajer, the ideas of the American Section and for the further purpose of enabling you to explain to me any errors in our views so that we might correct them, and in general bring the ideas of the governing body and of the American Section into harmony. As I elaborated the matter orally to you, you will probably prefer that I now simply recapitulate, long arguments by letter being always trying.

(1). We wish that the existence of the American Section, which is an accomplished fact, be formally recognized, and that a very large measure of independence be given it ; first, because our distance prevents the central governing body from either learning accurately our needs and conditions or easily executing its plans in America ; second, because it is our earnest demand ; third, because it is the native and unalterable habit of our people to work with independence.

(2). We wish that you, and through you the governing body, would accede to our demands as formulated by our Executive Committee. All these demands rest upon the desired independence, and can scarcely be discussed seriatim in the present letter.

(3). It is, of course, the wish of all that complete harmony should prevail. May I therefore ask your attention to the following facts :

A. The important formal and legally attested communication of our Executive Committee remained, I understand, for months unacknowledged ; I do not here refer to a complete answer to it, which might have required time, but to the lack of all acknowledgment, which could have been immediate.

B. The reply finally to be made by President Tetmajer refuses all our requests.

C. So far as I understand, all expression of regret at refusing our demands, or at leaving them so long unacknowledged, is lacking.

D. Its language may, I fear, convey to some the impression that it has been drawn with the purpose not of finding ways to comply with our demands, but of discovering excuses for refusing them.

E. Although President Tetmajer's reply might have been sent either direct to Chairman Merriman or through the accredited Representative of the American Section, myself, it is, I understand to be transmitted through Mr. Henning in spite of the fact that he has been shown to be *persona non grata* to the Executive Committee of the American Section.

F. The Paris Congress on Methodes d'Essai brought together most of the leading members of the International Association, including several very prominent American members, and the accredited representative of the American Section. No more suitable occasion for presenting the ideas of the American Section could well exist. Therefore, President Tetmajer was urgently requested repeatedly to come here and hold a Council meeting. He refused, offering no excuse which has come to my knowledge.

G. The American members here [in Paris] even though thus treated, wished to leave no stone unturned to lay their ideas respectfully before the important members of the International Association, especially its officers. We therefore urgently prayed them to attend an informal meeting for this purpose. None attended this meeting, though held in a convenient place and at a convenient time, except yourself and M. Debray.

H. President Tetmajer having asked Chairman Merriman to indicate a person acceptable as member of Council, and Chairman Merriman having informed him of the vote of the Executive Committee not approving of Mr. Henning, but nominating the writer, and Mr. Henning having been shown to be *persona non grata*, President Tetmajer decides that the *persona non grata* must be the American member of Council. This indicates, or is liable to be construed, as asking our wishes for the purpose of refusing them.

These points, A to H, are, I fear, liable to produce in certain quarters an unfavorable impression, even perhaps to lead some persons to the idea that some influential part of the governing body is hostile to the American Section. Indeed, I fear that there may even be those to whom it will appear that, with a view of restricting American competition, there has been a deliberate purpose to estrange the American Section. Needless to say, especially in view of your own remark to me, nothing could, in my opinion, be farther from the truth. But, in view of these several unfortunate features, I ask you whether, in your opinion, it would not be expedient that President Tetmajer make some expression which would tend to relieve any tension which may have arisen and to make his friendliness clear.

Allow me to call your attention officially to the fact that I am the only authorized representative of the American Section, and that I shall remain in Europe in care of MM. Hottingner et Cie, 38 Rue de Provence, Paris, until Sept. 15, 1900. My credentials have, I believe, been exhibited to you and remain open to inspection. I am prepared to discharge my functions.

N.

PRESIDENT TETMAJER TO CHAIRMAN MERRIMAN,

JULY 23, 1900.

According to a resolution taken at the Council meeting on the 23d and 24th of April, 1900, the decisions touching American affairs were forwarded to you through Mr. Henning some days ago. The expedition of these decisions, we are sorry to say, has been delayed to an undue extent, the cause for this postponement being the decisions themselves. To avoid misunderstandings and discords, we will acquaint you with the reason by giving the following explanation :

After the meeting in April, the Minutes of Proceedings were got ready without delay and, as usual, two copies were sent to every member present at the meeting with the request to add annotations and corrections and to send one copy back. This time the revision caused several differences of opinion, postponing the completion of the Minutes of Proceedings to such a degree that they were not finished until a fortnight ago. The dispatch of the extract of the minutes intended for your perusal suffered another unpleasant delay on account of Mr. Debray, who ought to have signed as member of the Executive Committee of the Council, refusing his signature, so that the letters intended for you had to be copied once more to be transmitted to you with only the signature of the President.

Our reporter at the Paris Congress, Mr. Zschokke, Secretary of the Association, has informed us meanwhile of the deplorable dissension existing between part of the American members and Mr. Henning, which makes us fear that you will not be satisfied with the Council's resolution. We can assure you that the Council takes a perfectly impartial and neutral attitude in the affair of the representation of the American members of the Association, and desires most of all to be in agreement with the wishes of the majority of the American members. It came to the conclusion that there existed perfect agreement after the receipt of your letter of July 3, 1899, by which you informed the President in answer to a letter to that effect, that according to your opinion it was not necessary to make any alteration in the American representation until the Paris Congress.

The Council's decisions were influenced besides by the statutes of the Association, according to which the members of Council are to be elected by the Congress; and if during the period elapsing between two Congresses a Member of Council resigns his office voluntarily or leaves it vacant by death or in some other way retires from office, the Council is the next competent authority to appoint a substitute provisionally, the wishes of the members of the Association of the respective country being naturally considered in the first place. But on the other hand, it is, according to the statutes still in operation, quite inadmissible for the members of a country to elect a representative themselves: besides the Council of the International Association cannot treat with the American Section, as the statutes of the Association do not provide for the institution of international sections, and the "American Section" as a whole is not even a member of the International Association, as for instance the "German" or "Hungarian Association for Testing Technical Materials."

We request you not to look upon this explanation as an unkind attitude of the Council toward the American Section ; on the contrary the formation of your Section is a proof of the lively interest shown by the American members of the Association with regard to the exertions of the International Council and this formation can, therefore, only be regarded with great pleasure, but the Council is obliged to keep for the present to the Statutes as agreed upon at the Zurich Congress of 1895. If the decisions of the latter are not kept there is no preventing arbitrary acts of all kinds. Experience has shown these Statutes to leave much to be desired ; for this reason already a long time ago the Council entrusted a special committee with a new draft of Statutes which will be submitted at the next Congress. But up to that time we are obliged to keep to the Statutes still in operation.

We mentioned above that the Council of the International Association had asked your consent to the provisional appointment of Mr. Henning and received the same in your letter of July 3, 1899. If since then the opinions of the American members of the Association have undergone a change with regard to their representative on the Council, we have, of course, not the intention of opposing the wishes of the American members to have another representation on the Council, in case this wish is really shared by the majority of the American members. In case, therefore, the American members desire a change we request you to take the vote of all the American members in a correct manner, and to send the result to the Council, which, if the result of the voting proves the desire for a change to exist, will certainly not fail to rediscuss its resolutions of the 23d and 24th of April, 1900.

The resolutions of the Zurich Council meeting were sent to you not directly, but through Mr. Henning, according to a resolution of the Council ordering all business communications of the latter with the American members of the Association, as is the case with the members of all the other nations, to pass through the hands of the Members of Council of each country, as the work of the central office at Zurich would otherwise grow to enormous proportions. The resolution of the Council was guided purely by practical considerations, and we should regret very much if you should regard it as a want of politeness on the part of the Council towards yourself and the American Section.

We repeat in the most decided way that the Council of the International Association regards the matter of the representation of the American members on the Council in an impartial way, personal consideration having nothing to do with it. The Council is acting legally according to the existing Statutes, and has only one aim in view, the true interests of the Association and the promotion of its scientific and practical problems.

O.

CHAIRMAN MERRIMAN TO SECRETARY ZSCHOKKE.

I learn from Prof. Howe, the American member of Council, of your kindness in listening to his statement of the wishes of the American Section and in laying the same before President Tetmajer. Allow me to thank you on behalf of our Executive Committee for this courtesy and kindness.

On March 14, 1900, President Tetmajer instructed me to procure the appointment of an American member of Council in any manner I thought proper. This letter was submitted to our Executive Committee on April 7, 1900, when Prof. Howe was appointed as the official representative of the American Section. Formal notice of this action was forwarded on April 9, 1900, to the International Council by Secretary Humphrey. The proceedings of the Council on April 23–24, as communicated to me by President Tetmajer on July 9, contain no reference to this official appointment by our Executive Committee, but show instead that the subject was discussed on Mr. Henning's petition to allow his functions to continue. In other words, no attention was paid to the wishes of American members, and our official communication was treated with discourtesy.

President Tetmajer's letter of July 23 is, I regret to say, filled with excuses which appear unsatisfactory. His statement that "the Council of the International Association can not treat with the American Section" is, in particular, an astonishing one, in view of the fact that the American Section was organized in 1898 under authorization of the Council, that it was officially recognized by the Council at its meeting in Paris in 1899, and that

President Tetmajer himself requested us to appoint our representative or American Member of Council.

The authorized and duly accredited American Member of Council, Prof. Henry M. Howe, will be in Europe until Sept. 13, 1900, his address being in care of MM. Hottinger et Cie, 38 Rue de Provence, Paris. I earnestly trust that the International Council, or its Executive Committee, will call a meeting in order to give him an opportunity to present the views of the American Section.

LIST OF MEMBERS.

The International List of Members distributed in February, 1900, contained the names of all members of the American Section on Jan. 15, 1900. The following are the changes since that date.

NEW MEMBERS.

BROCK, ARTHUR, President of American Iron and Steel Manufacturing Company, Lebanon, Pa.

CHURCHILL, CHARLES S., Engineer Maintenance of Way, Norfolk and Western Railway, Roanoke, Va.

CONDRON, T. L., Resident Engineer Pittsburg Testing Laboratory, 1750 Monadnock Building, Chicago, Ill.

DAVIDSON, GEORGE M., Chemist; Engineer of Tests, Chicago & Northwestern Railroad, Chicago, Ill.

DUGAN, CHARLES M., JR., Chemist; William Krouse & Sons Cement Company, Martins Creek, Pa.

JESSUP, ALFRED E., Metallurgist; Engineer of Tests, Treasury Department, Washington, D. C.

JOB, ROBERT, Chemist; Philadelphia & Reading Railway, Philadelphia, Pa.

MILLS, CHARLES M., Civil Engineer; Assistant Engineer in charge of Bridges, Bureau of Surveys, 418 City Hall, Philadelphia, Pa.

MORSE, ALBERT C., General Superintendent, Shelby Tube Company, Shelby, Ohio.

NATIONAL TUBE COMPANY, Conestoga Building, Pittsburg, Pa.

ROEBLING AND SONS, Wire Manufacturers, Trenton, N. J.

RICHARDS, JOSEPH T., Civil Engineer; Engineer Maintenance of Way, Pennsylvania Railroad, Broad Street Station, Philadelphia, Pa.

SCHNEIDER, HERMAN, Architect; Instructor in Civil Engineering in Lehigh University, Wall Street, Bethlehem, Pa.

TAYLOR, WILLIAM PERVUS, Civil Engineer; Inspector of Cement, 418 City Hall, Philadelphia, Pa.

THACKRAY, GEORGE E., Civil Engineer; Structural Engineer Cambria Steel Company, Johnstown, Westmont, Pa.

TIPPETT AND WOOD, Plate Iron and Steel Workers, Phillipsburg, N. J.

WHITEHEAD, J. W., JR., National Lead Company, 1510 State St., Chicago, Ill.

WING, CHARLES B., Civil Engineer; Professor of Structural Engineering, Stanford University, Cal.

WOOD, WALTER, Cast Iron Pipe Manufacturer, R. D. Wood Company, 400 Chestnut Street, Philadelphia, Pa.

TRANSFERS OF MEMBERSHIP.

AMERICAN STEEL AND WIRE COMPANY, The Rookery, Chicago, Ill. (Transferred by Shoenberger Steel Company.)

BETHLEHEM STEEL COMPANY; Albert Ladd Colby, Metallurgical Engineer; South Bethlehem, Pa. (Transferred by Bethlehem Iron Company.)

MUTUAL BOILER INSURANCE COMPANY, 31 Milk Street, Boston, Mass. (Transferred by Robert S. Hale.)

WITHDRAWALS.

BENJAMIN, CHARLES S.

SHELLENBERGER, LOUIS R.

INTERNATIONAL

ASSOCIATION FOR TESTING MATERIALS.

AMERICAN SECTION.

BULLETIN No. 20. OCTOBER, 1900.

PROGRESS REPORT OF COMMITTEE NO. 1.

PHILADELPHIA, PA., Sept. 15, 1900.

To the American Section of the International Association for Testing Materials :

In accordance with the approval of the Executive Committee the proposed specifications given in Bulletins 8 to 18 were widely distributed for discussion and brought out many suggestions, as shown by summary given below. But the general discussion of these specifications will be at the Annual Meeting of the American Section, Oct. 25th to 27th, the program of which has been published in Bulletin No. 19. At the afternoon session on Oct. 25th a report will be made of the action of the International Council regarding the increase of membership in the American Branch of Committee No. 1.

EVENING SESSION, THURSDAY, OCT. 25TH, 8.30 P.M.

STRUCTURAL STEEL FOR BUILDINGS.

STRUCTURAL STEEL FOR BRIDGES AND SHIPS.

OPEN-HEARTH BOILER PLATE AND RIVET STEEL.

Suggestions that have been brought up and will, no doubt, be further discussed :

I. Omit elastic limit in ordinary testing. It is impracticable to take correctly.

II. Use the old term "Elastic Limit" instead of the new term "Yield Point". In all cases specify an elastic limit of one-half ultimate and use dividers to check same.

III. Anneal all extra heavy boiler plates.

IV. Cold bends should always be made and quench bends not relied on as an equivalent.

V. Better to always specify per cent. of elongation in 8″ and make allowance for thickness, than to use a shorter base as an equivalent.

VI. The per cent. of reduction of area is not a reliable measure of the quailty of steel when tests are made on rectangular test pieces.

VII. Limit of 0.04 phosphorus for basic open-hearth boiler plate.

VIII. Not necessary to specify carbon limit on boiler plate.

IX. In ordinary boiler plate where plates are not planed and holes not reamed, use steel of not over 62,000 lbs. T. S.

X. Limiting full-sized bends of fire-box steel should be increased to 1″.

XI. Provision should be made for increasing the phosphorus and sulphur in drillings from boiler shell plate over drillings from test ingot.

XII. Should give more definite instructions for match-marking boiler-plates.

XIII. Grade of 70,000 to 80,000 lbs. ultimate strength bridge steel proposed.

XIV. Higher tensile strength boiler steel proposed, 65,000 to 75,000 lbs. T. S.

XV. Objections raised to high limit of tensile strength of soft steel overlapping the low limit of tensile strength of medium steel.

XVI. Importance of drifting tests.

XVII. Use only open-hearth steel for buildings.

XVIII. All eye-bars should break in body.

XIX. Softer steel for eye-bars.

XX. Higher steel for eye-bars.

XXI. Phosphorus in basic open-hearth steel for bridge plates not over 0.04.

XXII. Danger of getting oxides in basic open-hearth steel when we try for too low phosphorus in the metal.

MORNING SEESION, FRIDAY, OCT. 26TH, 10.00 A.M.

STEEL RAILS.

STEEL SPLICE BARS.

Suggestions that have been brought up and will, no doubt, be further discussed :

I. Use of higher carbon in heavy rails.

II. Upper limit of phosphorus to be 0.08 in rails.

III. One drop test on piece of rail from each heat of steel.

IV. Limit the amount of shrinkage in length of rails from temperature of rolling to normal temperature. To check brittleness from finishing rails in rolling at *too high a temperature.*

V. Danger in using a very high carbon in rails that have large mass of metal in head and small amount of metal in flanges.

VI. As carbon is increased phosphorus must be decreased in rail steel.

VII. Harder steel proposed for splice bars.

VIII. Phosphorus limit of 0.085 for steel rails instead of 0.10.

AFTERNOON SESSION, FRIDAY, OCT. 26TH, 3.00 P.M.

STEEL TIRES.

STEEL AXLES.

STEEL FORGINGS.

Suggestions that have been brought up and will, no doubt, be further discussed :

I. To anneal all axles.

II. To anneal all forgings.

III. Location for taking drilling for analysis should not be specified, as it is well to take them from the center and know the worst.

IV. High limit on ultimate strength should be specified in all cases.

Evening Session, Friday, Oct. 26th, 8.30 p.m.

STEEL CASTINGS.

WROUGHT IRON.

Suggestions that have been brought up and will, no doubt, be further discussed :

I. All castings should be annealed.

II. High limit on ultimate strength should be specified.

These are only preliminary specifications, as the members of Committee No. 1 voted for them on the following proposition :

" It should be understood that all that is now asked to be voted on is as follows :

" Are these proposed specifications fair representative specifications of the best American practice and specifications in use in this country? It should be further understood that these specifications will come up for general discussion at the Annual Meeting of this Association in October next, after which they will be referred back to this Committee to make any changes that are found necessary."

Particular attention is called to this in order that our Engineering Societies and Engineers may understand that any matters brought up at the October Meeting will have direct influence on the specifications to be finally adopted. With this in view, they are cordially invited to assist us by taking an active part in the discussion.

Part of the work assigned to this Committee was to report on the best means of bringing these specifications into general use, when in final shape. We decided that the most practical plan was to increase the membership of the Committee so as to include the representatives of the principal steel manufacturers, and to put on an equal number of engineers to balance their vote. This was done with the approval of our Executive Committee, and the manufacturers have done a great deal of the work in preparing the tables giving a synopsis of the specifications in use for each class of material. They also attended all of the meetings and gave us the advantage of their experience in getting the proposed specifications in their present convenient shape for discussion. This has all been misunderstood, and the proposed specifications have been referred to as "Manufacturers' Specifications," and as being "too lenient," etc. This has come about by the engineers on this Committee being too busy to attend its meetings. It now remains with them and the members of this Association to take up these specifications in detail and decide each requirement on its merits. By doing this, any changes that are necessary in the proposed specifications will be made.

We have at least one year before there is any need of making a final report on these American Specifications, and I trust that each of the engineering societies will take up and report on the specifications they are most interested in. For instance, the mining engineers could take up the metallurgical matters and chemical requirements.

The American Society of Civil Engineers could take up specifications of structural steel for bridges and structural steel for buildings.

The Mechanical Engineers would do a great service by bringing their previous reports on the methods of testing up-to-date through a general discussion of their reports. (As they have never been discussed.)

The Engineers of Maintenance of Way have already taken up the matter of rail specifications, and their coming reports must be considered by this Association.

The Master Mechanics' Association appointed a committee to report on the advisability of their co-operating with us, and they could take up specifications for locomotive forgings, boiler materials, steel castings, tires, axles, etc.

The Naval Architects and Marine Engineers could take up hull material, boiler material, steel forgings, and steel castings.

The above is merely given as a suggestion of how this field could be thoroughly covered. The importance of securing *representative specifications* is so great, that each will, no doubt contribute his part to the work.

The following letter from Mr. R. S. Buck, chief engineer in charge of bridges No. 3 and 4 City of New York, is submitted, and his "Queries" will come up for discussion with the specifications for bridge materials on Thursday evening, Oct. 25th.

Attached to this report is a specification for locomotive forgings suggested by Mr. H. V. Wille, with his views for asking that it may be adopted. This specification was sent to all members of the committee last spring, and will now come up for discussion with the forging specifications.

WM. R. WEBSTER,
Chairman of the American Branch of Committee No. I.

DEPARTMENT OF BRIDGES,
CITY OF NEW YORK, Sept. 13, 1900.

Mr. William R. Webster, Chairman of American Branch of Committee No. 1, 411 Walnut St., Philadelphia, Pa.

DEAR SIR: — Will you kindly submit the following to your Committee for discussion with other matters pertaining to steel specifications that will come up at your October meeting:

There is a difference of opinion among those interested in the manufacture and use of steel for bridge purposes, as to what requirements should be embodied in the specifications for this material. This difference of opinion has at times manifested itself in open controversy and litigation.

In preparing the specifications for the proposed East River Bridges Nos. 3 and 4, it is desired to secure a quality of steel which will give the broadest latitude to the manufacturer, and admit of the widest competition practicable with the certainty of obtaining the high and uniform class of material required.

We therefore take the liberty of asking from you, as an expert in the manufacture and use of steel, an expression of your opinion on certain essential points, to aid us in reaching a decision equitable alike to the consumer and producer, according to the preponderance of all proper considerations.

We would adopt all necessary precautions in the selection of the stock and in the manufacture of the steel to insure a uniform and reliable product of the most suitable quality for the purpose. We would expect this steel to be more carefully made than the ordinary run of bridge material, as well as stronger and more reliable, and would therefore expect to pay a somewhat higher price for it, but we do not wish to carry refinements beyond the point where we cease to receive full value for the additional price to be paid.

Bridge No. 3 is to be a suspension bridge and Bridge No. 4 a cantilever. In different parts of the structures the dead load stresses will vary from 1 to 4 1/2 times the live load stresses. They will be designed for heavy city service, but not for railroad service.

Queries.

(A) What chemical requirements should be imposed in the case of steel for plates and shapes?

(*a*) For acid open-hearth steel?

(*b*) For basic open-hearth steel?

(B) Same for eye-bar material?

(C) Should acid steel be required exclusively in either or both of the cases (A) and (B)?

(D) What is the highest carbon steel, defined by percentage of carbon and by ultimate strength and elastic limit, that can properly be used in truss members in the form of plates and shapes? In this case assume that all holes will be drilled throughout.

(E) What is the highest carbon steel, defined as before, that can be properly used in eye-bars?

(F) Can steel of 72,000 to 80,000 pounds ultimate strength, and 40,000 pounds minimum elastic limit, be properly adopted in cases (D) and (E)?

(G) Should restrictions as to character of stock and methods of manufacture be imposed at all? If so, to what extent?

(H) What physical tests should be specified in cases (D) and (E)?

(I) What chemical and physical requirements should be imposed in

(*a*) Steel castings?

(*b*) Steel forgings, such as pins?

(*c*) Rivet steel?

We would like your opinion on one other question, as it is one which naturally affects the cost of work, although not pertaining to steel making:

(J) Do you consider the work performed by impact riveters in the field sufficiently good to warrant a reduction of the usual 25% added for field rivets? If so, how much should this reduction be?

Very truly yours,
R. S. Buck,
Chief Engineer in Charge, Bridges Nos. 3 and 4.

COPY.

Philadelphia, April —, 1900.

Mr. Wm. R. Webster, Chairman of Committee No. 1:

Dear Sir: — I attach herewith my preliminary vote on specifications submitted in Bulletins Nos. 9 to 17 inclusive.

I have voted in the affirmative on all specifications on broad grounds, though there are requirements in some of the specification which are not representative of American practice, when judged by comparison with the tabulated statements of various specifications compiled by the committee. I also attach herewith a specification for locomotive driving axles, crank pins, rods and guides, and would respectfully ask you to submit same to the full committee for vote. At one of the former meetings of the committee this proposition was voted down, the argument being that provision was made for the same grade of steel in the general specifications for forgings. This, however, is not quite the case, because the general specification rightly covers steel made by any process, open-hearth, crucible and Bessemer, and also provides for the various kinds of special steels. Reference to the tabular statement for forgings issued by the various railroad companies show an open-hearth carbon steel of about 80,000 pounds tensile is desired by practically all of them.

I believe the committee would be warranted in adopting a special specification of this kind for the following reasons:

1st. Reference to Bulletin No. 18 shows that the International Chairman desires materials for locomotives considered under a separate grouping.

Other countries will follow this course, and it would be advisable for the American Section to have specifications that will permit of ready comparison with those suggested by other sections of the Association.

2d. The large amount of this special class of forgings used annually.

3d. Reference to the compilation of forging specifications, Bulletins Nos. 3 and 15, show that it is the users of this class of forgings who, more than any others, purchase their material to specifications.

4th. It will avoid confusion. The way the matter now stands the committee on forgings have compiled two sets of specifications, one for locomotive forgings and one for general forgings. The former is attached to the specifications for axles; the latter to those for general forgings. Obviously, if the general specifications for forgings are to cover those for locomotives, the compilation for the latter should have been attached to the general specifications. In its present status, it would appear that it is the committee's intention to have locomotive forgings covered by the axle specification. This you know is not the case. The adoption of this new specification would render it advisable to omit reference to driving axles in the specification for axles, because there is nothing in common in the test requirements of driving and truck axles.

Yours truly,
H. V. WILLE.

INTERNATIONAL ASSOCIATION FOR TESTING MATERIALS, AMERICAN SECTION.

STANDARD SPECIFICATIONS ARE COMMENDED BY MR. H. V. WILLE.

Forgings for locomotive driving axles, crank pins, rods, and guides.

PROCESS OF MANUFACTURE.

1. Steel for these forgings shall be made by the open-hearth process.

CHEMICAL PROPERTIES.

2. Steel shall not contain more than 0.05 phosphorus nor more than 0.05 sulphur.

PHYSICAL PROPERTIES.

3. Tensile tests.

The minimum limits for the respective tests shall be as follows:

Tensile strength, pounds per sq. inch	75,000
Yield-point, pounds per sq. inch	37,000
Elongation, per cent. in two inches	18.
Contraction of area, per cent	30.

4. Bending test.

A specimen one inch by one-half (1″ x 1/2″) around a diameter of 1–1/2″ shall bend cold 180° without fracture on outside of bent portion.

5. Test pieces and methods of taking sample for chemical analysis.

Turnings from the tensile bar or drillings from the bending test shall be used to determine whether or not the steel is within the limits in phosphorus and sulphur specified in paragraph No. 2.

6. Test piece for tensile test.

The standard turned test piece one-half inch (1/2″) diameter and two inches (2″) gauged length, shall be used to determine the physical properties specified in paragraph No. 3. It is shown in following sketch.

7. Yield-point.

The yield-point specified in paragraph No. 3 shall be determined by the careful observation of the drop of the beam or halt in the gauge of the testing machine.

8. Test piece for bending.

The specimen for bending test one inch by one-half inch (1″ x 1/2″) shall be cut as specified in paragraph No. 9. The bending test shall be made by steady pressure and not by sudden blows.

9. Number and location of tests.

The test bars for both tension and bending shall be cut cold from a full sized prolongation of the forging, parallel to the axis of the same and half way between the center and outside, the length of the bar to correspond with the direction in which the metal is most drawn out. One tension and one bending test will be required for every heat.

FINISH.

10. Forgings shall be free from cracks, flaws, seams, or other injurious imperfections, and shall conform to dimensions shown on drawings furnished by the purchaser and be made and finished in a workman-like manner.

INSPECTION.

11. The inspector represents the purchaser, shall have reasonable facilities afforded to him by the manufacturer to satisfy him that the finished material is furnished in accordance with these specifications.

All tests and inspections shall be made at the place of manufacture prior to shipment.

LIST OF MEMBERS.

ADDITIONS.

Clark, H. H., Mechanical Engineer ; Chicago, Burlington, and Quincy Railroad, 209 Adams St., Chicago, Ill.

INTERNATIONAL
ASSOCIATION FOR TESTING MATERIALS.

AMERICAN SECTION.

BULLETIN No. 21. MARCH, 1901.

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INTERNATIONAL CONGRESS OF 1901.

A meeting of the Council of the International Association was held at Zurich, on February 2, 1901, at which Prof. Henry M. Howe was appointed American Member of Council to represent the American Section and all American members. The following letter, received by Prof. Howe, gives notice of the Congress which is to be held at Buda-Pesth in September next:

ZURICH, February 23, 1901.

To the Honorable Members of Council and Representatives of the International Association for Testing Materials.

DEAR SIR :—As is known to you, the Council of the International Association for Testing Materials resolved at its last meeting in Vienna to hold the next Congress of the International Association at Buda-Pesth from the 9th to 14th of September, 1901. The resolution was adopted to arrange the Programme of Proceedings and the division of work exactly in the same manner, as far as possible, as was applied at the Stockholm Congress in 1897.

According to this resolution the transactions of the Congress will be carried on partly at full meetings and partly at sectional meetings.

In the full meetings the following programme will be adhered to:

(*a*) Papers of a general scientific nature.

(*b*) Final Propositions of the chairman of sectional meetings.

(*c*) General affairs dealing with the business and organization of the Association.

In the sectional meetings, on the other hand, the reports of the various International Committees would have to be considered under the headings:

(*a*) Metals.

(*b*) Natural and Artificial Building Stones and their Bond-Materials.

(*c*) Other Technical Materials.

As for the papers to be discussed in the full meetings containing matters of a scientific nature, the Council resolved to devote considerable attention to them at the coming Congress, more than they had done at any previous Testing Congress.

These reports would have less bearing on the usual testing methods than on new views and observations tending to further development and describing the chemical, physical and mechanical properties of various materials. We refer chiefly to the new theories and researches on the molecular constitution of bodies, on the laws of motion and deformation of the smallest particles under the influences of external forces, on microscopical investigations, etc.

In order to assure the Congress of Buda-Pesth the co-operation of eminent scientific men, the Council charged the President of the Association to request the Members of Council and the Representatives to correspond with such persons with a view of inviting them to read papers at the Buda-Pesth Congress.

Your country having been of late one of the most prominent in modern testing methods, we take the liberty of stating our request to employ your influence with men of science in your country whom you consider suitable to invite in the name of the

Council to attend our Congress for the purpose of enriching our programme of proceedings by reports and communications of various kinds on their latest investigations. Above all we have the agreeable duty of requesting you to have the kindness of making a communication of some sort taken from your large knowledge and extensive experience.

As has been our custom hitherto, we have the intention of getting all the reports for the Buda-Pesth Congress printed in at least two languages. It is absolutely necessary to have the manuscripts in our possession not later than the 1st of June, 1901, so that they can be translated and printed in time.

We request you to inform us of the result of your efforts as soon as possible.

Thanking you before hand for your trouble and with the assurance of our most distinguished consideration, we remain

Yours most respectfully,

INTERNATIONAL ASSOCIATION FOR TESTING MATERIALS.
By Order of the Council, *The President*, TETMAJER.

THIRD ANNUAL MEETING OF THE AMERICAN SECTION.

The Third Annual Meeting of the American Section of the International Association for Testing Materials, was held at the house of the American Society of Mechanical Engineers, No 12 West Thirty-first Street, New York City, on October 25, 26 and 27, 1900. During these days six sessions were held. The following members and guests were in attendance, at the first or subsequent sessions:

American Foundrymen's Association, represented by R. G. G. Moldenke.
American Society of Mechanical Engineers, represented by F. R. Hutton, Secretary.
Bethlehem Steel Company, represented by Albert Ladd Colby, Metallurgical Engineer.
W. H. Broadhurst, Chemist, Department of Highways, Brooklyn, N. Y.
R. S. Buck, Engineer Department of Bridges, New York City.
Cambria Steel Company, represented by George E. Thackray, Structural Engineer.
Carnegie Steel Company, represented by John McLeod, Assistant to President.

T. L. Condron, Pittsburg Testing Laboratory, Chicago, Ill.
Charles B. Dudley, Chemist Pennsylvania R. R.
Engineering News, represented by G. H. Hill.
Engineering Record, represented by J. M. Goodell.
Gus. C. Henning, Consulting Engineer, New York City.
Henry M. Howe, Columbia University, New York City.
Richard L. Humphrey, Civil Engineer, Philadelphia, Pa.
Illinois Steel Company, represented by P. E. Carhart, Inspecting Engineer, and C. E. Stafford, Manager O. H. and Plate Mill.
Robert Job, Chemist P. & R., Reading, Pa.
Paul Kreuzpointner, Testing Department, Pennsylvania R. R.
Lukens Iron and Steel Company, represented by C. L. Huston, Vice-President.
Mansfield Merriman, Lehigh University, South Bethlehem, Pa.
Charles M. Mills, Assistant Engineer Bureau of Surveys, Philadelphia, Pa.
R. G. G. Moldenke, Consulting Engineer, New York, N. Y.
Pennsylvania Steel Company, represented by H. H. Campbell, General Superintendent.
J. M. Porter, Lafayette College, Easton, Pa.
The Iron Age, represented by Charles Kirchhoff.
Technischer Verein of Philadelphia, represented by J. C. Paulis.
Samuel Tobias Wagner, First-Assistant Engineer Bureau of Surveys, Philadelphia, Pa.
George S. Webster, Chief Engineer Bureau of Surveys, Philadelphia, Pa.
William R. Webster, Civil Engineer, Philadelphia, Pa.
Max H. Wickhorst, Engineer of Tests, C. B. & Q. R. R., Aurora, Ill.
H. V. Wille, Baldwin Locomotive Works, Philadelphia, Pa.

FIRST SESSION.

The opening session was called to order at 3.10 P.M on Thursday, October 25th, by the Chairman, Prof. Mansfield Merriman.

The minutes of the Second Annual Meeting, as printed in Bulletin No. 6, were approved. After the credentials of the delegates representing the various Societies and Corporations had been presented and accepted, the Chairman made the following address :

ADDRESS OF THE CHAIRMAN.

At the Second Annual Meeting, held last year in Pittsburg, I gave an address on the history and work of the International Association for Testing Materials and of its American Section. To-day I shall merely state a few facts regarding the progress of our work during the past year, and briefly indicate a method by which, in my opinion, the effectiveness of our organization may be promoted and its important technical work be carried on more successfully than before.

The Council of the Association, at a meeting held in September of last year, formally abandoned the plan of holding its Congress at Paris in 1900, and recommended that all members support the Congress on the Testing of Materials which had been called by the authorities of the Paris Exposition. That Congress was held in July with successful results; of the forty papers announced to be read it is gratifying to note that six were by members of this American Section, a greater number than from any other country with the exception of France. While this Congress took no action on the subject of unification of tests, it is believed that its discussions have materially assisted in this direction.

The Council of the International Association has held but two meetings during the past year. At the session in September, 1899, besides the question of the Paris Congress, the only business of importance was the consideration of proposed changes in the statutes; one of these provides that the members of Council are to be chosen by the members of the Association in their respective countries. Regarding the session in April, 1900, I have no information except that contained in two letters from President Tetmajer; one of these relates to the representation of the American Section on the International Council and is published in Bulletin No. 19; the other relates to the increase of membership in the American Branch of Committee No. 1, and will be read under the fifth order of business this afternoon.

It may here be plainly stated that the policy of the International Association in regard to publications is not satisfactory to many American members. The proceedings of the Council meetings are not published, no financial statements are given out, and practically nothing is known of the work of the technical committees. This is the more remarkable because the Journal "Baumaterialienkunde" has been designated as the official organ of the Association and receives compensation therefor. Yet in the twenty-four numbers of that journal from July 1, 1899 to July 1, 1900, there are only eight pages of the total four hundred and twelve pages which contain official matter of the Association.

Besides the eight pages in "Baumaterialienkunde" there have been issued by the Association during the past year two circulars relating to the Paris Congress, and a pamphlet containing an International List of Members and Technical Committees. This list was closed on June 30th, but the copies of the same forwarded to this country did not reach us until January, by which time our membership had increased so that the number of copies was not sufficient to supply all the American members. In addition to the above I have to acknowledge the receipt on July 27, 1900, of a typewritten copy of the minutes of the Council meeting held ten months previously, namely, on September 25 and 26, 1899.

Attention may also properly be called to the fact that no statements regarding the expenditures of the Association have ever been made, as far as I am able to learn. As the American Section has regularly transmitted to the International Council $1.50 per year for each of its members, it would seem that such statements are due us. In my opinion, it becomes a question to be carefully considered as to whether this state of affairs ought to continue indefinitely. After the experience of over two years in conducting business with the International Authorities, I have been forced to the conclusion that a reorganization is necessary in order to enable it to effectively conduct its affairs and successfully carry on its scientific work.

The reform that I would advocate is one suggested by the experience of the American Section, which now issues bulletins, giving the reports of the committees, the proceedings of the meetings and regular quarterly statements of receipts and expenditures. Let the members of the Association in each country from a National Section, which shall conduct its own affairs, levy its own taxes, elect its own representative on the International Council, and publish its own proceedings. Let the members of technical committees in each country report to meetings of their National Section where their proposals may be discussed, so that they shall finally have a true national character. Let the various National Sections interchange their publications and each criticize the technical views of the others. At stated times let International Congresses be convened to discuss and unify the views of the National Sections, and it is plain that the work of such Congresses can be more quickly done and will have greater authority than under the present system, where each national branch of a committee has little or no knowledge of the views of members in other countries. The expenses of these Congresses assessed upon the different Sections in proportion to the number of members, and this item seems to be the only international expense that is necessary or desirable.

Regarding the work of this American Section I need say but little, as the reports of our officers will give detailed information. The report of the Secretary will show that the increase in our membership has been steady and gratifying. The report of the Treasurer will show that subscriptions aggregating to $705 have been made to the Publication and Research Fund, which was inaugurated at our last meeting. The statement of the Publication Committee will show that seventeen Bulletins, containing our proceedings and the reports of two of our technical committees, have been issued. Eleven of these are devoted to the Specifications recommended by the American Branch of Committee No. 1, and at its request were issued in editions of large size. The inset sheets of these Bulletins have proved a heavy expense in spite of the fact that a large share of the cost was kindly borne by the *Railroad Gazette*, and it is a matter of regret that no balance now remains in the Publication Fund. I doubt not, however, that at this meeting, as at the one in Pittsburg, members will feel the imperative necessity of the publication of our proceedings and come forward with generous subscriptions to that fund.

A large part of the time of this meeting is to be devoted to the discussion of the Specifications recommended by the American Branch of Committee No. 1 for iron and steel under various conditions of use. The discussions already held before other societies indicate some diversity of opinion, which will here doubtless be materially harmonized, and it is to be hoped that the work of this meeting will be such as to lead to results advantageous alike to both producers and consumers.

In conclusion let me express the opinion that the work of our International Association, important in the past, is to be still more important in future years. Its scientific investigations are now but barely begun, and its technical problems are but slightly advanced toward solution. This American Section, which includes all the members of the Association resident in the United States, is ready and anxious to co-operate with the members in other countries and with the international officers in advancing these scientific and industrial labors. I sincerely trust that all the deliberations of this meeting may tend to promote harmonious co-operation, effective work, and results that shall be valuable to all the branches of the engineering profession.

At the close of the above address, the reports of the officers were presented. The Secretary read the following report:

REPORT OF THE SECRETARY.

Two years have now elapsed since the formation of the American Section of the International Association for Testing Materials. Since this time there has been a gradual growth in the membership and a corresponding increase in the strength of the organization.

The total membership at the First Annual Meeting was but 70. At the last Annual Meeting there were 128 members, with only one withdrawal.

The total membership at this, our Third Annual Meeting, is 160; we have lost but six members since our organization.

The total receipts and expenditures from August 15, 1899, to October 25, 1900, have been as follows:

Receipts :

Dues, 1899	$ 26.00	
Dues, 1900	360.00	
Dues, 1901	2.50	
Dues paid in excess	1.00	
		$389.50

Expenditures :

Secretary's office	$ 13.60	
Postage, telegrams, expressage	9.75	
By cash, P. Kreuzpointner, Treasurer, Dec. 30, 1899	19.50	
By cash, P. Kreuzpointner, Treasurer, Jan. 17, 1900	5.00	
By cash, P. Kreuzpointner, Treasurer, Mar. 31, 1900	255.85	
By cash, P. Kreuzpointner, Treasurer, July 2, 1900	51.50	
By cash, P. Kreuzpointner, Treasurer, Oct. 25, 1900	34.30	
		$389.50

Six members are in arrears for dues for 1899 and 1900, and eleven are in arrears for 1900.

The Executive Committee has held four meetings. At the meeting held October 21, 1899, rules were adopted for its government; in accordance therewith the committee holds regular quarterly meetings.

The editing of the official bulletin of this Section, beginning with Number 4, has been in the hands of the Publication Committee.

The report of the Second Annual meeting, the report of the Committee on Impact tests, and the minutes of the Executive Committee meetings appeared in Bulletins 4, 5, 6 and 7.

The report of Committee No. 1 appears in Bulletins 8–18, inclusive, while the program for the Third Annual Meeting and other matters relating to the American Section, appears in Bulletins 19 and 20.

[Signed] RICHARD L. HUMPHREY,
Secretary American Section.

On motion this report was accepted and placed on file.

REPORT OF THE TREASURER.

This report includes the receipts and disbursements of the Publication and Research Fund, and the receipts and disbursements under the General Fund.

PUBLICATION AND RESEARCH FUND.

Receipts.

1899.	Contributions as follows:		
Aug. 18,	Robert A. Carter	$100.00	
Aug. 28,	Logan Iron & Steel Co	20.00	
Sept. 6,	Carbon Steel Co	50.00	
Sept. 8,	Standard Steel Co	25.00	
Sept. 27,	J. M. Porter	100.00	
Oct. 14,	Wayne Iron & Steel Co	50.00	
Oct. 26,	Central Iron & Steel Co	50.00	
Nov. 29,	Robert W. Lesley	20.00	
Nov. 29,	Bethlehem Steel Co	100.00	
Dec. 1,	Altoona Iron Co	100.00	
Dec. 4,	Milton Iron Co	10.00	
Dec. 9,	Shoenberger Steel Co	30.00	
1900.			
Feb. 26,	Illinois Steel Co	50.00	
			$705.00

Disbursements.

1899.			
Dec. 1.	Printing Bulletins Nos. 4–6	$ 85.50	
Dec. 30.	Treasurer's office	4.15	
1900.			
Jan. 9.	Account of Committee No. 1	39.26	
Feb. 16.	Printing Bulletin No. 7	12.40	
Aug. 15.	Account of Committee on Impact Tests	25.00	
Aug. 25.	Tables for Bulletins Nos. 8–17	250.96	
Oct. 22.	Printing Bulletins Nos. 8–20	354.63	
	Total disbursements		$771.90
	Deficit		$66.90

(This deficit was covered by transfer of $66.90 from the General Fund.)

GENERAL FUND.

Receipts.

1899.			
Oct. 16.	Secretary's balance	$ 29.65	
1900.			
Jan. 3.	Dues	$ 27.50	
Jan. 6.	3/5 pro rate	1.80	
Mar. 31.	Dues	274.50	
Apr. 10.	Refunded by International Association	10.41	
Apr. 10.	3/5 pro rate	8.19	
June 30.	Dues	52.50	
July 1.	3/5 pro rate	1.68	
Oct. 25.	Dues	40.00	
			$446.23

Disbursements.

1900.			
Jan. 7.	Secretary's office	$ 3.00	
Jan. 7.	Dues paid to G. C. Henning	19.50	
Jan. 15.	Printing	6.50	
Feb. 16.	Printing	7.75	
Mar. 1.	Excess dues to H. B. Seaman	1.00	
Mar. 31.	Secretary's office	18.65	
Apr. 10.	Dues paid to International Association	163.50	
June 30.	Secretary's office	1.00	
June 30.	Treasurer's office	1.80	
July 9.	Dues paid to International Association	31.50	
Sept. 4.	Account of Committee No. 1	26.32	
Oct. 22.	Account of Publication Committee	70.34	
Oct. 22.	Transfer to cover deficit in Publication and Research Fund	66.90	
Oct. 25.	Treasurer's office	1.25	
Oct. 25.	Secretary's office	5.70	
			$424.71
	Balance receipts over disbursements		$21.52

[Signed] P. KREUZPOINTNER,
Treasurer.

The Chairman called attention to the fact that at the last Annual Meeting an Auditing Committee had been appointed to audit the accounts of the Secretary and Treasurer. He suggested that such a Committee be appointed at this meeting, and on motion, the Chairman appointed Messrs. McLeod and Condron to act as an Auditing Committee.

The Publication Committee made the following report :

REPORT OF THE PUBLICATION COMMITTEE.

Since its appointment on August 16, 1899, this Committee has issued 17 Bulletins, aggregating 184 pages, with eleven inset sheets and nine cuts. For Bulletins Nos. 4, 5, 6, 7, 19, and 20 there were printed 1000 copies of each, while for Bulletins Nos. 8–18 there were printed 3000 copies.

There have also been printed 500 membership blanks, six pages of 140 copies each for insertion in the International List of Members, 200 ballot slips with envelopes therefor, and 3000 envelopes for mailing Bulletins.

The cost of these publications has been as follows :

Bulletins Nos. 4, 5, 6, 7	$ 91.90
Bulletins Nos. 8-18	279.33

Inset sheets for Bulletins Nos. 8-17		250.96
Expressage on inset sheets		8.55
Bulletin No. 19, with ballot slips and envelopes		43.50
Bulletin No. 20		17.25
Membership blanks		6.50
International List of Members		7.75
Envelopes for mailing Bulletins		9.00
Expenses of Distribution :		
Expressage	$27.45	
Postage	40.58	
Boxes, paper and twine	2.31	
		70.34
Total		$785.08

The distribution of this printed matter is shown by the following statements :

Membership Blanks.

Number of copies printed		500
To the Secretary	200	
To members	112	
To engineers not members	28	
		340
Copies on hand, October 1, 1900		160

International List of Members.

Number of copies received from American Member of Council		140
To members	138	
To copies damaged in printer's hands in making changes and additions	2	
		140

Ballots and Addressed Envelopes.

Number of copies printed	200
To members	166
Copies on hand, October 1, 1900	34

Mailing Envelopes.

Number of envelopes printed	3000
To envelopes used for mailing, etc	1970
Envelopes on hand, October 1, 1900	1030

Bulletins.

No. 4. An address by the Chairman of the American Section on "The Work of the International Association for Testing Materials." Issued September, 1899. Number of pages	10
No. 5. "Preliminary Report on the Present State of Knowledge Concerning Impact Tests." By Professors W. Kendrick Hatt and Edgar Marburg. Issued October, 1899. Number of pages	26

No. 6. Reports and transactions of the Second Annual Meeting of the American Section. Issued November, 1899. Number of pages	20
No. 7. Reports presented at meeting of the Executive Committee. Issued January, 1900. Number of pages	8
No. 8. "Proposed Standard Specifications for Structural Steel for Bridges and Ships." With two inset sheets. Issued May, 1900. Number of pages	6
No. 9. "Proposed Standard Specifications for Structural Steel for Buildings." With one inset sheet. Issued May, 1900. Number of pages	6
No. 10. "Proposed Standard Specifications for Open-Hearth Boiler Plate and Rivet Steel." With one inset sheet. Issued May, 1900. Number of pages	8
No. 11. "Proposed Standard Specifications for Steel Rails." With one inset sheet, Issued May, 1900. Number of pages	6
No. 12. "Proposed Standard Specifications for Steel Splice Bars." With one inset sheet. Issued May, 1900. Number of pages	4
No. 13. "Proposed Standard Specifications for Steel Axles." With two inset sheets. Issued May, 1900. Number of pages	4
No. 14. "Proposed Standard Specifications for Steel Tires." With one inset sheet. Issued May, 1900. Number of pages	4
No 15. "Proposed Standard Specifications for Steel Forgings." With one inset sheet. Issued May, 1900. Number of pages	6
No. 16. "Proposed Standard Specifications for Steel Castings." With one inset sheet. Issued May, 1900. Number of pages	4
No. 17. "Proposed Standard Specifications for Wrought Iron." With one inset sheet. Issued May, 1900. Number of pages	6
No. 18. Report of Committee No. 1; also list of members of American Branch of Committee No. 1. Issued May, 1900. Number of pages	10
No. 19. Program of Third Annual Meeting of American Section, reports of Executive Committee; also correspondence relating to representation of American Section on the International Council. Issued September, 1900. Number of pages	28
No. 20. Report of Committee No. 1, giving suggestions relative to discussion of specifications. Issued October, 1900. Number of pages	12
Total number of pages, including Bulletins Nos. 1, 2 and 3	184

Copies of Bulletins Nos. 8–18 were furnished to the following Societies for discussion : American Society of Civil Engineers, American Society of Mechanical Engineers, American Institute of Mining Engineers, Master Car Builders Association, American Railway Master Mechanics Association, and American Association for the Advancement of Science.

At this date there are on hand 150 copies of Bulletin No. 4, 228 copies of No. 5, 348 copies of No. 6, 748 copies of No. 7, 900 copies of Nos. 8 and 9, 1,000 copies of No. 10, 1,400 copies of Nos. 11, 12, 13 and 14, 1,000 copies of Nos. 15 and 16, 900 copies of No. 17, 850 copies of No. 18, 729 copies of No. 19, and 710 copies of No. 20.

[Signed] J. M. PORTER,
Secretary of Publication Committee.

On motion of Mr. McLeod, a vote of thanks was given to Prof. J. M. Porter for his labors in connection with the publication of the Bulletins of the American Section.

REPORT OF THE EXECUTIVE COMMITTEE ON THE MEMBERSHIP OF COMMITTEE NO. 1.

The Executive Committee presented the following report on the membership of the American Branch of Committee No. 1:

In 1898, pursuant to a request of the International Council that five American members be appointed on Committee No. 1, the following were designated by the Executive Committee of the American Section: The Franklin Institute; W. R. Webster; H. H. Campbell; James Christie; and Carnegie Steel Company, represented by John McLeod. These appointments were later approved by the Chairman of the International Committee No. 1, and by the International Council.

At a meeting of the Executive Committee held on February 22, 1899, Mr. Henning stated that the International Council had authorized each national branch of an International Committe to increase its membership, whereupon it was resolved that such increase might be permitted subject to the approval of the Executive Committee.

Under this authorization the American branch of Committee No. 1 submitted from time to time the names of additional members to the Executive Committee, who approved the same subject to the action of the International Council. The names of these additional members are given in Bulletin No. 18.

On April 9, 1900, the Secretary forwarded these names to the International Council, which duly considered the subject at its meeting on April 23, 1900, and the following letter giving its decision was received by the Chairman on July 27, 1900.

JULY 9, 1900.

Prof. Mansfield Merriman, Chairman of the American Section of the International Association for Testing Materials, Lehigh University, South Bethlehem, Pa.

SIR: At the last meeting of the Council of the International Association on the 23d and 24th of April, 1900, a letter written by the Secretary of the American Section I. A. T. M., Mr. Richard L. Humphrey and dated April 9, 1900, was laid before the Council. This letter informs the Council of the International Association that the Executive Committee of the American Section had decided to increase the number of American members on Committee No. 1 from 5 to 26 and gives a list of the 26 chosen, asking at the same time, if the Council agreed to the resolution mentioned above.

The Council thanks the American Section for this proposal, but, though they acknowledge the interest and zeal shown by the members of the American Section in the solution of one of the most important problems of the International Association, they do not consider it advisable to agree to the resolution of the American Section.

The following considerations have decided the Council:

The too numerous representation of one country will, with regard to the rest, disturb the balance and in voting matters the due proportion of the committee and will give other countries the right of demanding the same number of representatives—as indeed they have already done in case the recommendations of the American Section be adopted. But if a proportionate representation should be granted to other countries—and justice would oblige us to accept also this increase—the members of this Committee would increase to such a degree that the work and the mutual correspondence were rendered exceedingly difficult. On the other hand the Council is only too happy, if, by the assistance of a considerable part of the members, the wishes of scientific men in one country are expressed in the most decided, comprehensive and complete way possible.

On this subject a member of Council expressed his opinion that the members concerned in the technical problems of the Association might form International Sub-committees according to necessity or desire, the representatives of which would be the members of the General Committee as they are at present acknowledged.

This resolution was, therefore, unanimously adopted in the following words :

The President of the Association is commissioned to write, by order of the Council to the Chairman of the American Section stating the Council formed the resolution of having the same number of American members on Committee No. 1 as decided on at the beginning, but to leave it to the American Section to form a Sub-committee for the problem to be treated, the wishes and proposals of this Sub-committee to be submitted by the five representatives already on the Committee to the General Committee in due form.''

Hoping this resolution will meet the approval of the American Section of the International Association, we remain,

Very faithfully yours,
International Association for Testing Materials.
[Signed] *The President*, TETMAJER.

Mr. Webster moved that the report of the Executive Committee be accepted and placed on file, and that this section expresses its approval in the letter of President Tetmajer, that the American Branch of Committee No. 1 have but five votes, but that in casting these five votes, that all the members of Committee No. 1 should have equal voice ; Professor Hutton moved that this be amended by inserting the word '' concurrence '' instead of '' approval.''

Mr. Stafford wanted to know how the work done by the Section was going to be made useful ; the Chairman stated that it is impossible to state just how the work would be conducted in the future ; that would depend largely on the action of the International Association. Mr. Stafford also wanted to know why Committee No. 1 was made so large. Mr. Webster explained that inasmuch as the work of Committee No. 1 covered such an extensive field, the work could not be performed better than by dividing it up among a number of small representative committees. In order to do this it was necessary, therefore, to have a large Committee, so as to include men who were experts on the various subjects.

After considerable discussion Mr. Webster withdrew his previous motion and substituted the following: "that the report of the Executive Committee be accepted and placed on file, and that the American Section expresses its concurrence in the request contained in President Tetmajer's letter, that the American Branch of Committee No. 1 have but five votes, but that all members of the American Branch of Committee No. 1 should have equal voice in casting these five votes, and in all deliberations of the American Branch." This motion was carefully discussed. Mr. Webster withdrew his motion in favor of a motion offered to the effect that the report of the Executive Committee be accepted and placed on file, and that the report be referred to a special committee composed of Mr. Webster and Professor Hutton, to report later. This motion was carried unanimously.

REPORT OF THE EXECUTIVE COMMITTEE ON REPRESENTATION ON THE INTERNATIONAL COUNCIL.

The Executive Committee also presented the following report upon the Representation of the American Section on the International Council:

The correspondence printed in Bulletin No. 19 gives the full history of this question. It appears that the American Section has been asked three times during the present year to express its opinion on this subject. The action of the Executive Committee on April 7, 1900, in provisionally appointing Professor Henry M. Howe as American Member of Council, was taken in accordance with the requests of President Tetmajer, in his letters of February 19th and March 14th (See pages 155 and 158 of Bulletin No. 19). The action of the Executive Committee in ordering a ballot at this time for American Member of Council was taken at the request of President Tetmajer in his letter of July 23rd (see page 167 of Bulletin No. 19).

Since Bulletin No. 19 was printed a letter has been received from Secretary Zschokke, which contains another request that such a ballot be taken, as the following extract shows:

"Prof. Tetmajer, in his letter of July 23rd, has made you a proposal of meditation, according to which all American members shall elect the American Representative in the Council of the International Association. If adopted, this proposal has undoubtedly the advantage of clearly expressing the views of the majority of the American members. Nothing can be more agreeable to the Council of the International Association than to be in harmony with the views of the majority of the American members. * * * We are anxious to hear how his proposal of meditation will be received by you and the American Executive Committee. Prof. Tetmajer, who has taken a vacation to-day for some time, has the intention of calling together a session of the Council of the International Association in October or November; then this affair will come under discussion. Therefore it would be agreeable to me if you would inform us before October how this proposal is received by the American Executive Committee, or what wishes that Committee has to send to the Council."

In reply to this letter the Chairman informed Secretary Zschokke that a ballot for Member of Council had been ordered by the Executive Committee, that the same would be counted on October 25th, and the result be promptly forwarded to the International Council. A copy of the ballot slip and of Bulletin No. 19 was also mailed to him and to each Member of the Council.

It appears from the above that the Council of the Association, through its President and Secretary, has requested the American members to vote for their Representative on the International Council, and has intimated that the choice shall be confirmed at its next meeting.

The above report was accepted and placed on file.

AMENDMENTS TO BY-LAWS.

The following amendments to the By-Laws were presented by Messrs. Merriman, Humphrey and Kreuzpointner:

OCTOBER 25, 1900.

The undersigned propose the following amendment to the By-Laws:

Strike out Article 4, and substitute the following:

Article 4. The officers of the American Section shall be a Chairman, a Vice-Chairman, a Secretary, and a Treasurer, who shall hold office for two years.

The Executive Committee shall consist of these officers, together with two members; one being elected at each Annual Meeting, and each of them serving for two years.

The Chairman shall be ex-officio, the nominee for American Member of Council of the International Association.

Respectfully proposed by
MANSFIELD MERRIMAN,
RICHARD L. HUMPHREY,
PAUL KREUZPOINTNER.

The Chairman suggested that the discussion of these amendments be deferred until later. Mr. A. L. Colby moved that the proposed amendments be discussed and voted on to-morrow afternoon, under Section 19 of the program; this motion was carried unanimously.

APPOINTMENT OF TELLERS.

The Chairman appointed Messrs. Colby and Condron as Tellers to count the Letter Ballots for Officers, and gave them the following instructions:

1. Members in arrears are not entitled to vote.
2. A Ballot not autographically signed by the voter will not be counted.

Recess was taken at 4.30 to assemble at the call of the Chair.

ELECTION OF OFFICERS.

The meeting was called to order at 5.25, and the Tellers then presented the following report:

NEW YORK, October 25, 1900.

To the Chairman of the American Section, International Association for Testing Materials:

DEAR SIR: We, the undersigned Tellers, report the following count of ballots cast for officers:

Total number of members enrolled		160
Number of members in arrears in dues, and therefore not entitled to vote		18
Total number entitled to vote		142
Number of votes received unsigned or signed with rubber stamps, and therefore thrown out		4
Number of votes received from members in arrears, and therefore thrown out		3
Total number of legal votes received		90
For Chairman, Henry M. Howe	89	
For Chairman, William R. Webster	1	

For Vice-Chairman, Charles B. Dudley	90
For Secretary, J. M. Porter	90
For Treasurer, Robert W. Lesley	90
For American Member of Council	90

[Signed] ALBERT LADD COLBY,
T. L. CONDRON,
Tellers.

The Chairman then declared the following officers elected :

Chairman	Henry M. Howe
Vice-Chairman	Charles B. Dudley
Secretary	J. M. Porter
Treasurer	Robert W. Lesley
American Member of Council	Henry M. Howe

Upon invitation of the retiring Chairman the new Officers entered upon their duties, and Prof. Howe assumed the Chair. After a few remarks by the Chairman, thanking the members for the honor which they had conferred upon him, the first session adjourned at 5.50 P.M.

INFORMAL DINNER.

The Annual Informal Dinner was held at the "Arena," West 31st Street, at 6.30 P.M., at which 25 members and guests were present.

SECOND SESSION.

The second session was called to order at 8.35 P.M., twenty-five members being present.

REPORT OF AMERICAN BRANCH COMMITTEE NO. 1.

The report of Committee No. 1, as published in Bulletin No. 20, was presented by its Chairman, W. R. Webster.

The general discussion of the specifications for Structural Steel, and Open Hearth Boiler Plate and Rivet Steel proposed by Committee No. 1 in Bulletins Nos. 8, 9, and 10 for adoption by the American Section as standards, occupied the balance of this session, which adjourned at 11.10 P.M.

THIRD SESSION.

The third session was called to order Friday, October 26, at 10.15 A.M., fifteen members being present.

A detailed discussion of the Specifications for Steel Rails, Bulletin No. 11, and the Specification for Steel Splice Bars, Bulletin No. 12, occupied the most of this session.

Certain changes were suggested and these Specifications were referred back to Committee No. 1.

REPORTS OF COMMITTEES.

Reports from the following Committees were presented:

Committee No. 2.—To establish methods of inspection and testing for determining the uniformity of individual shipments of iron and steel. Mr. W. R. Webster reported progress.

Committee No. 3.—On the properties of soft steel at abnormally low temperatures. No report.

Committee No. 4.—Methods of testing welds and weldibility. Mr. Wille reported progress.

Committee No. 5.—Collection of data for establishing standard rules for piece tests, with special reference to axles, tires, springs, pipes, etc. Mr. Wille reported progress.

Committee No. 6.—On the most practical method for polishing and etching for the microscopic study of iron and steel. No report.

COMMITTEE NO. 1.

The special Committee composed of Mr. Webster and Prof. Hutton to whom was referred the Report of the Executive Committee, relative to increasing membership of Committee No. 1, reported as follows:

Resolved, That the Report of the Executive Committee be accepted and placed on file;

Resolved, That the American Section records its hearty concurrence in the action of the International Council as expressed in the letter of President Tetmajer, which has limited the American membership of Committee No. 1 to five persons.

Resolved, That in the deliberative work and recommendations of Committee No. 1 of the American Section the 34 members already taking part have equal votes, the majority action of this number constituting the official action of the Committee.

On motion, the above report was accepted.

American Member of Council.

The Secretary read a letter to the International Council signed by the retiring Chairman and Secretary, certifying to the choice of Prof. Howe by the American Section as American Member of Council. This letter contained a copy of the report of the tellers.

On motion, the meeting adjourned at 12.40 P.M.

FOURTH SESSION.

The fourth session was called to order October 26th, at 3.15 P.M., Vice Chairman C. B. Dudley occupying the chair; twenty-four members were present.

A detailed discussion of the Specification for Structural Steel, for Bridges and Ships, Bulletin No. 8, and the Specification for Structural Steel for Building, Bulletin No. 9, occupied most of this session.

Certain changes were suggested and these Specifications referred back to Committee No. 1.

Reports of Committees.

The Chair called for reports from Committees Nos. 7, 8, 9, 10, 11, 12, 13, 14 and 15. Prof. Merriman reported progress for Committee No. 7, Mr. Humphrey for Committee No. 8, and Prof. Porter for Committee No. 9.

Approval of By-Laws.

The By-Laws proposed at the first session were then taken up and discussed, and unanimously adopted. The Secretary was instructed to forward a copy of the amended By-Laws to the International Council.

On motion the meeting adjourned at 5.45 P.M.

FIFTH SESSION.

The fifth session was called to order October 26th at 8.45 P.M., twenty members being present. Dr. Dudley occupied the chair.

The discussion of the Proposed Standard Specifications was continued, and included the Specifications for Open-Hearth Boiler Plate and Rivet Steel, Bulletin No. 10; Steel Tires, Bulletin No, 14; Steel Castings, Bulletin No. 16, and Wrought Iron, Bulletin No. 17.

Certain changes were suggested, and these Specifications referred back to Committee No. 1.

Under miscellaneous business the Chair called for reports from Committees Nos. 16, 17, 18, 19, 20 and 21, all of which failed to report.

On motion of Mr. A. L. Colby, duly seconded, Prof. Merriman was nominated as a member of the Executive Committee of the American Section. On motion of Mr. Campbell, duly seconded, Mr. A. L. Colby was nominated for member of the Executive Committee. On further motion the nominations were closed, and the Secretary instructed to cast the ballot. The Chair announced that Messrs. Merriman and Colby were elected members of the Executive Committee of the American Section.

On motion, the meeting adjourned at 11 P.M.

SIXTH SESSION.

The sixth and final session was called to order on Saturday, October 27th, at 10.15 A. M., fifteen members being present. Prof. Henry M. Howe, Chairman, presiding.

On motion, Prof. Merriman's term as member of the Executive Committee was fixed at two years, and Mr. Colby's term at one year. The Secretary read the following report from the American Committee A on Impact Tests:

REPORT OF THE COMMITTEE ON IMPACT TESTS.

LAFAYETTE, IND., October 23, 1900.

To the Members of the American Section of the International Association for Testing Materials :

The Committee appointed to report on the present state of knowledge concerning Impact Tests, begs to report the completion of the bibliography of the literature in the English, French, and German languages, relating to such tests. Having completed the work mapped out, the Committee requests its discharge.

Respectfully submitted,

[Signed] W. K. HATT,
EDGAR MARBURG.

On motion, the above report was accepted and this Committee was discharged.

Committee B failed to report and was, on motion, discharged.

Committee C reported progress through Prof. Howe, and was continued.

Committee D reported through Mr. Webster, who stated that Committee No. 1 had covered or intended to cover this subject, and therefore requested that Committee D be discharged. On motion, Committee D was discharged.

Committee E reported as follows :

PROGRESS REPORT OF THE AMERICAN COMMITTEE E ON THE INVESTIGATION OF THE MAGNETIC PROPERTIES OF IRON AND STEEL.

OCTOBER 10, 1900.

To the American Section of the International Association for Testing Materials :

Your Committee reports that, since the time of its appointment at the last annual meeting of the association, good progress has been made, and that arrangements are practically complete for carrying out systematically the research program here outlined. Active experimentation is already in progress, and although your Committee can not, at this time, make more than a Progress Report, its affairs are, nevertheless, in a promising condition.

To the end of ultimately being sufficiently advised in the premises to admit of your Committee feeling warranted in submitting for your consideration a list of standard specifications for iron and steel used in the construction of electrical machinery, it is thought best to prosecute the following series of investigations, to be reported upon as rapidly as possible.

1. To determine the most accurate method of making permeability and hysteretic tests of magnetic materials.

This work is being vigorously prosecuted by Messrs. J. W. Esterline and E. B. Smith, who have given the subject much attention, and consented to have your Committee avail itself of their researches.

2. To determine the per cent. of loss in permeability due to scale on iron and steel castings.

Through the medium of this set of tests, it is desired to ascertain how the permeability of the metal varies with the depth of penetration towards the center of the casting. The tests of pieces for this work are already provided.

3. To determine the per cent. of change in the permeability of iron and steel castings, that is brought about by chilling. For this work castings have been made from the same ladle, part being allowed to cool in the sand, and part being open and exposed to the air as soon as hard enough.

4. To determine the effect of position-in-the-mold on the permeability of cast iron and cast steel.

This investigation is for the purpose of ascertaining the law of variation, if there is any, in the permeability of samples taken from the bottom and the top, respectively, of castings. Test pieces for this investigation are being worked up.

5. To determine the per cent. of difference in the permeability and hysteretic constants of two samples cut from the same section of a piece of rolled metal, one sample being turned up with the grain, and the other turned up across the grain.

This investigation is in progress, and will be extended to the end of determining the general law of variation.

6. To determine the effects of heat treatment upon the magnetic properties of iron and steel.

In the conduct of this work, a careful record will be kept of the heat treatment of the test metal during each stage of its manufacture, and an, as nearly as possible, complete microphotographic record will be made of the changes in the structure of the metal throughout the heat treatment. Two laboratories equipped for the carrying out of this work will co-operate with the Committee in this investigation.

7. To determine the effect of different percentages of impurities on the permeability and hysteretic constants of irons and steels which have been subjected to the same heat treatment.

This research will be develoved along lines involving the keeping of a complete record of the chemical and magnetic properties of the samples, as well as a record of their changing microstructure. The resources of three laboratories, at least, can be depended upon to render assistance in this investigation.

Your Committee will be very grateful for any assistance that any one can render in carrying out the work outlined. There is so much to be accomplished that room abounds for the efforts of a large number of experimenters. Only by a broad review of the field in a broad way can the desired ends be attained. From intercommunication between interested parties, much good can certainly be expected, and your Committee seeks co-operation. The reports of tests made by others will be most gratefully received and reviewed.

Mr. J. A. Capp, the third member of your Committee "E," expresses his wish to study the subject further before accepting the above scheme of study. The lines of investigation may therefore be modified considerably during the progress of the actual operation, and we can only again request the co-operation of all the most interested.

[Signed] W. E. Goldsborough,
Richard G. G. Moldenke.

On motion the above report was accepted and ordered placed on file, and the Committee continued.

Specifications.

The discussion of the Proposed Standard Specifications was concluded by taking up the Specification for Steel Axles, Bulletin No. 13, and the Specification for Steel Forgings, Bulletin No. 15. The discussion of these two specifications included remarks as to the relative merits of turned test bars of 2″ and 8″ gauged length. On motion, this subject and the above two Specifications were referred back to Committee No. 1.

On motion of Mr. Stafford, Committee No. 1 was instructed to present its final report at the next annual meeting of the American Section, which meeting shall take place before the next Congress of the International Association for Testing Materials.

Mr. Webster stated that it was desirable to have the Engineering Societies continue their discussion of the Proposed Standard Specifications, and on motion of Mr. Condron, this matter was referred to the Executive Committee, with power to act.

Votes of Thanks.

The Auditing Committee called attention to the fact that *The Railroad Gazette* had printed the valuable inset sheets of tables for Bulletins Nos. 8–17 at a cost of $450.96 and had charged only $250.96 for the same, thus virtually donating $200.00 to the Publication and Research Fund. A motion was then unanimously passed thanking *The Railroad Gazette* for its generous donation.

On motion of Mr. Humphrey, a cordial vote of thanks was tendered to the officers and members of the American Society of Mechanical Engineers for the use of their House, and for other courtesies and privileges received.

AUDITORS' REPORT.

Mr. Condron reported for the Auditing Committee, and stated that a small apparent discrepancy had been discovered between the Secretary's and Treasurer's books. The Committee asked to be discharged from further services, as they were compelled to leave town. On motion, this was done, and the Chair authorized to appoint a new Committee. [Messrs. Webster and Marburg were appointed as the new Committee, and subsequently reported that the discrepancy had been adjusted, and that the reports of the Secretary and Treasurer as printed above, are correct.]

On motion, the third annual meeting adjourned at 11.45 A.M.

MEETING OF THE EXECUTIVE COMMITTEE.

October 27, 1900.

The members of the Executive Committee met at the House of the American Society of Mechanical Engineers, 12 West Thirty-first Street, New York City, immediately after the adjournment of the Third Annual Meeting of the American Section. The following members were present: Messrs. Howe, Merriman, Colby, Dudley and Porter, with Messrs. Humphrey and Kreuzpointner on invitation, Prof. Howe in the Chair and Prof. Porter, Secretary.

On motion of Dr. Dudley, Messrs. Merriman, Colby and Porter were appointed a Committee on Publication.

On motion of Prof. Merriman, the Chair appointed Dr. Dudley and Mr. Colby a committee to invite subscriptions to the Publication Fund.

On motion of Dr. Dudley, Prof. Howe and Mr. Webster were appointed a Committee to devise plans to present the Specifications as contained in the report of Committee No. 1 to the various Engineering Societies for discussion.

On motion of Prof. Merriman, the Secretary was instructed to communicate to the International Council, the By-Laws of the American Section as amended at the late meeting.

On motion of Dr. Dudley, the Executive Committee endorsed and approved the bill before Congress, establishing a National Standardizing Bureau.

On motion of Messrs. Colby and Dudley, the Secretary was instructed to write to all members in arrears for dues relative to their accounts.

There being no further business, the meeting adjourned, subject to the call of the Chairman.

MEETING OF THE EXECUTIVE COMMITTEE.

January 5, 1901.

The Executive Committee of the American Section of the International Association for Testing Materials met at the residence of Prof. Henry M. Howe, 27 West 73d Street, New York City, January 5, 1901. The following members were present: Messrs. Howe, Colby, and Porter, Prof. Howe in the Chair, and Prof. Porter as Secretary.

The minutes of the last meeting, October 27, 1900, were read and approved.

A recent statement in the engineering papers regarding the appointment of Mr. G. C. Henning by the American Society of Mechanical Engineers to attend a meeting of the Council of the International Association at Zurich was discussed.

Mr. Colby reported progress for the Committee on Funds for Publication.

Prof. Howe reported on behalf of the Committee "to devise plans for presenting to the National Engineering Societies the Specifications recommended by Committee No. 1," and reported progress.

The Secretary laid before the Committee the resignation of Mr. Gus. C. Henning as member of the American Section, contained in his letter of December 19th, and on motion his resignation was accepted.

There being no further business, the meeting adjourned, subject to the call of the Chairman.

LIST OF MEMBERS.

The following changes in the American Section of the International Association have occurred since October 1, 1900.

ADDITIONS.

BRAINE, L. F., General Manager Continuous Rail Joint Company, Newark, N. J.

BURY, EDMUND, Foreman Tool and Physical Department, Ingersoll-Sergeant Drill Company, 685 Washington Street, Easton, Pa.

CLARK, H. H., Mechanical Engineer, Chicago, Burlington, and Quincy Railroad, 209 Adams Street, Chicago, Ill.

COFFIN, JOHN N., Consulting Mechanical Engineer, 312 Perry Payne Building, Cleveland, Ohio.

EMRIE, ALMON, Factory Supervisor, Superintendent Ingersoll-Sergeant Drill Company, Easton, Pa.

FAHRIG, ERNST, Chief of Laboratories, Philadelphia Commercial Museums, Philadelphia, Pa.

FREEMAN, S. E., Consulting Mechanical Engineer, 4052 Olive Street, St. Louis, Mo.

HAYDOCK, R. R., Engineer, 421 Chestnut Street, Philadelphia, Pa.

JOHNSON, WALLACE C., Consulting Engineer, Niagara Falls, N. Y.

LARKIN, JOHN P., Engineer, 430 Endicott Building, St. Paul, Minn.

LAWRENCE, WM. H., Massachusetts Institute of Technology, Boston, Mass.

LOWETH, CHAS. F., Engineer and Superintendent of Bridges and Buildings, C. M. & St. P. Ry., 1100 Old Colony Building, Chicago, Ill.

MITCHELL, WM. H., Engineer, 100 Broadway, New York, N.Y.

NELSON, E., Engineer, 1433 Marquette, Building, Chicago, Ill.

TRANSFERS OF MEMBERSHIP.

HAGAR, EDWARD M., Manager Cement Department, Illinois Steel Company, 1060 The Rookery, Chicago, Ill. (Transferred from Jasper Whiting).

ILLINOIS STEEL COMPANY, Rookery Building, Chicago, Ill. (Transferred from P. E. Carhart.)

CHANGES OF ADDRESS.

AMERICAN FOUNDRYMEN'S ASSOCIATION, Dr. Richard G. G. Moldenke, Secretary, P. O. Box 432, New York, N. Y.

BRAMWELL, JOS. W., Mechanical Engineer, Philadelphia Machine Tool Company, Philadelphia, Pa.

COLBY, J. ALLEN, Witherspoon Building, Philadelphia, Pa.

DUGAN, CHARLES M., 2139 North Seventh Street, Philadelphia, Pa.

MOLDENKE, RICHARD G. G., Metallurgist, Consulting Engineer, P. O. Box 432, New York, N. Y.

RICE, FRANCIS S., S. V. Huber & Co., Rooms 702–707, Ferguson Block, Pittsburg, Pa.

RICHARDSON, CLIFFORD, New York Testing Laboratory, Long Island City, N. Y.

TECHNISCHER VEREIN, OF BROOKLYN, Bartholomew Viola, M. E., 11 Bartlett Street, Brooklyn, N. Y.

RESIGNATIONS.

GWILLIAM, GEORGE T.
KAYLOR, JOHN J.
HENNING, GUS. C.
SEAMAN, HENRY B.

DIED.

JARECKI, CHARLES, Erie, Pa.

OFFICERS OF THE AMERICAN SECTION.

1900–1902.

Chairman.—HENRY M. HOWE, Professor of Metallurgy in Columbia University, New York, N. Y.

Vice-Chairman.—CHARLES B. DUDLEY, Chemist of Pennsylvania Railroad, Altoona, Pa.

Secretary.—J. M. PORTER, Professor of Civil Engineering in Lafayette College, Easton, Pa.

Treasurer.—ROBERT W. LESLEY, President American Cement Company, 22 South 15th Street, Philadelphia, Pa.

Executive Committee.

HENRY M. HOWE. CHARLES B. DUDLEY. J. M. PORTER.
ROBERT W. LESLEY. MANSFIELD MERRIMAN.
ALBERT LADD COLBY.

Publication Committee.

ALBERT LADD COLBY. J. M. PORTER.
MANSFIELD MERRIMAN.

Financial Committee.

CHARLES B. DUDLEY. ALBERT LADD COLBY.

American Member of the International Council.

HENRY M. HOWE.

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INTERNATIONAL
ASSOCIATION FOR TESTING MATERIALS.

AMERICAN SECTION.

BULLETIN NO. 22. MAY, 1901.

FOURTH ANNUAL MEETING.

The Fourth Annual Meeting of the American Section will be held at Niagara Falls, N. Y., on Saturday, June 29, 1901, the day after the close of the Convention of the American Society of Civil Engineers. The headquarters will be at the International Hotel, where the sessions will also be held. There will be three sessions, and the following is the preliminary program of proceedings :

First Session, Saturday, June 29, 10 A.M.

1. Address by the Chairman.
2. Report of the Secretary.
3. Report of the Treasurer.
4. Report of the Publication Committee.
5. Report of the Committee on Finance.
6. Report of the Executive Committee regarding Representation on the International Council.
7. Report of the Executive Committee regarding the Congress at Buda-Pesth, in September, 1901.

8. Discussion regarding the proposed revision of the statutes of the International Association.

9. Miscellaneous Business.

SECOND SESSION, 3 P.M., JUNE 29.

10. Report of Committee No. 1.

11. Discussion of the specifications recommended by the American Branch of Committee No. 1 for Structural Steel for Buildings, Structural Steel for Bridges and Ships, and Open-hearth Boiler Plate, and Rivet Steel.

12. Discussion of the specifications recommended by the American Branch of Committee No. 1 for Steel Rails, and Steel Splice Bars.

13. Miscellaneous Business.

14. All members are invited to meet at an informal dinner in the International Hotel at 6.30 P.M.

THIRD SESSION, 8 P.M., JUNE 29.

15. Discussion of the specifications recommended by the American Branch of Committee No. 1 for Steel Axles, Steel Tires, and Steel Forgings.

16. Discussion of the specifications recommended by the American Branch of Committee No. 1 for Steel Castings, and Wrought Iron.

17. Reports of other Technical Committees on Iron and Steel.

18. Reports of the Technical Committees on Cements.

19. Reports of other Committees on Materials.

20. Report of the Auditors.

21. Unfinished business.

INTERNATIONAL ASSOCIATION FOR TESTING MATERIALS.

AMERICAN SECTION.

BULLETIN No. 23. JUNE, 1901.

LIST OF MEMBERS OF THE AMERICAN SECTION OF THE INTERNATIONAL ASSOCIATION FOR TESTING MATERIALS.

	Date of membership.
Aertsen, Guilliaem General Manager Latrobe Steel Company, 1200 Girard Building, Philadelphia, Pa.	1898.
American Foundrymen's Association Richard Moldenke, Secretary, P. O. Box 432, New York, N. Y.	1898.
American Society of Mechanical Engineers F. R. Hutton, Secretary, 12 West 31st Street, New York, N. Y.	1897.
American Steel & Wire Company The Rookery, Chicago, Ill.	1900.
Anderson, Frederick Paul Dean of School of Mechanical Engineering, State College of Kentucky, Lexington, Ky.	1899.
Anderson, J. W Carbon Steel Company, Pittsburg, Pa.	1896.
Anderson, R. Wilson Superintendent Open Hearth, Carbon Steel Company, Pittsburg, Pa.	1897.

BARBOUR, FRANK A .... 1898.
Civil Engineer, Snow & Barbour, 1121 Tremont Building, Boston, Mass.

BENNEVILLE, JAMES S. DE .... 1896.
Analytical Chemist, University Club, 1510 Walnut Street, Philadelphia, Pa.

BETHLEHEM STEEL COMPANY .... 1898.
Albert Ladd Colby, Metallurgical Engineer, South Bethlehem, Pa.

BISSELL, GEORGE W .... 1896.
Professor Mechanical Engineering, Iowa State College, Ames, Iowa.

BLACK, W. P .... 1896.
Manufacturer, Erie, Pa.

BOOTH, GARRETT & BLAIR .... 1896.
Engineers and Chemists, 406 Locust Street, Philadelphia, Pa.

BRAINE, L. F .... 1900.
General Manager Continuous Rail Joint Company, Newark, N. J.

BRAMWELL, JOSEPH W .... 1898.
Philadelphia Machine Tool Company, Philadelphia, Pa.

BROADHURST, W. H .... 1899.
Chemist, Department of Highways, 13–21 Park Row, New York, N. Y.

BROCK, ARTHUR .... 1900.
President American Iron & Steel Manufacturing Company, Lebanon, Pa.

BROWN, WILLIAM .... 1899.
Superintendent of Steel Plant and Engineer of Tests, Phoenix Iron Works, Phoenixville, Pa.

BRUNT, H. L .... 1896.
Secretary and Treasurer of Monongahela Iron and Steel Company, Box 215, Pittsburg, Pa.

BUEL, ALBERT W .... 1898.
Civil Engineer, 11 West Twenty-fifth Street, New York, N. Y.

BURR, WILLIAM H .... 1899.
Professor of Civil Engineering, Columbia University, New York, N. Y.

Bury, Edmund .... 1901.
Foreman Tool and Physical Test Departments, Ingersoll-Sergeant Drill Company, Easton, Pa.

Cambria Steel Company .... 1899.
Charles S. Price, General Manager, Johnstown, Pa.

Campbell, H. H .... 1896.
Superintendent and General Manager Pennsylvania Steel Company, Steelton, Pa.

Capp, John A .... 1898.
Engineer, Testing Laboratory, General Electric Company, Schenectady, N. Y.

Carbolineum Wood Preserving Company .... 1899.
C. S. McKinney, Manager, Park Row, New York, N. Y.

Carnegie Steel Company .... 1898.
John McLeod, Asst. to President, Pittsburg, Pa.

Carpenter, Rolla C .... 1895.
Professor Experimental Engineering, Cornell University, 31 Eddy Street, Ithaca, N. Y.

Carter, Robert A .... 1899.
President Monongahela Iron & Steel Company, Box 215, Pittsburg, Pa.

Churchill, Charles S .... 1900.
Engineer Maintenance of Way, Norfolk & Western Railway, Roanoke, Va.

Christie, James .... 1898.
Chief Mechanical Engineer, American Bridge Company, Pencoyd, Pa.

Clark, F. H .... 1900.
Mechanical Engineer, Chicago, Burlington & Quincy Railroad, 209 Adams Street, Chicago, Ill.

Coffin, John N .... 1901.
Consulting Mechanical Engineer, 312 Perry Payne Building, Cleveland, Ohio.

Colby, Albert Ladd .... 1899.
Metallurgical Engineer, Bethlehem Steel Company, South Bethlehem, Pa.

Colby, J. Allen .... 1899.
Inspecting Engineer, Witherspoon Building, Philadelphia, Pa.

Colorado Fuel and Iron Company .... 1900.
J. A. Kebler, Second Vice-President and General Manager, Boston Building, Denver, Colo.

Condron, T. L .... 1900.
Resident Engineer, Pittsburg Testing Laboratory, 1750 Monadnock Building, Chicago, Ill.

Corthell, E. L .... 1899.
Civil Engineer, 27 Pine Street, New York, N. Y.

Criukshank, Barton .... 1899.
Director Clarkson School of Technology, Potsdam, N. Y.

Daniels, Frederick H .... 1899.
Chief Engineer American Steel and Wire Company, Worcester, Mass.

Davidson, George M .... 1900.
Engineer of Tests, Chicago & Northwestern Railroad, Chicago, Ill.

Deans, John Sterling .... 1899.
Chief Engineer Phoenix Bridge Company, Phoenixville, Pa.

Dow, A. W .... 1898.
Inspector of Asphalts and Cements, District of Columbia, Washington, D. C.

Drown, Thomas M .... 1899.
President Lehigh University, South Bethlehem, Pa.

Dudley, Charles B .... 1896.
Chemist Pennsylvania Railroad, Altoona, Pa.

Dufour, F. O .... 1901.
Instructor in Civil Engineering in Lehigh University, South Bethlehem, Pa.

Dugan, Charles M., Jr .... 1900.
Chemist, 2139 North Seventh Street, Philadelphia, Pa.

Ely, Theodore N .... 1896.
Chief of Motive Power, Pennsylvania Railroad, Broad Street Station, Philadelphia, Pa.

Emrie, Almon .... 1901.
Superintendent Ingersoll–Sergeant Drill Company, Easton, Pa.

Engineering Record .... 1898.
Henry C. Meyer, Jr., Editorial Staff, 100 William Street, New York, N. Y.

Estrada, E. D .... 1896.
Mechanical Engineer, Lewis Block, Pittsburg, Pa.

Fahrig, Ernst .... 1900.
Chief of Laboratories, Philadelphia Commercial Museums, Philadelphia, Pa.

Flagg, Stanley G., Jr .... 1899.
Stanley G. Flagg & Company, Nineteenth Street and Pennsylvania Avenue, Philadelphia, Pa.

Franklin Institute .... 1898.
Dr. William H. Wahl, Secretary, 15 South Seventh Street, Philadelphia, Pa.

Freeman, S. E .... 1901.
Consulting Mechanical Engineer, 4052 Olive Street, St. Louis, Mo.

Giessler, E. A .... 1898.
Assistant Engineer United States Engineer Office, Savannah, Ga.

Goldsborough, W. E .... 1899.
Professor Electrical Engineering, Director Electrical Laboratory, Purdue University, 618 South Street, Lafayette, Ind.

Goss, William F. M .... 1896.
Professor of Mechanical Engineering, Purdue University, Lafayette, Ind.

Graves, Edwin G .... 1899.
Civil Engineer, 650 Main Street, Hartford, Conn.

Gray, Thomas .... 1896.
Professor Dynamic Engineering, Rose Polytechnic Institute, Terre Haute, Ind.

Grist, B. N .... 1900.
Superintendent Riehlé Bros. Testing Machine Company, 4108 Westminster Avenue, Philadelphia, Pa.

Hagar, Edward M .... 1901.
Manager Cement Department, Illinois Steel Company, 1060 The Rookery, Chicago, Ill.

Hartranft, William G .... 1898.
Cement Manufacturer, 305 Girard Building, Philadelphia, Pa.

Hatt, William K. .... 1898.
Associate Professor of Applied Mechanics, Purdue University, Lafayette, Ind.

Haydock, R. R. .... 1901.
Engineer, 421 Chestnut Street, Philadelphia, Pa.

Howe, Henry M. .... 1896.
Professor Metallurgy, Columbia University, 27 West Seventy-third Street, New York, N. Y.

Humphrey, Richard L. .... 1896.
Manager Buckhorn Portland Cement Company, Girard Building, Philadelphia, Pa.

Hunt, Robert W., Company .... 1899.
Inspecting and Testing Engineers, 1121 The Rookery, Chicago, Ill.

Huston, Charles L. .... 1899.
Vice-President Lukens Iron and Steel Company, Coatesville, Pa.

Illinois Steel Company .... 1900.
Rookery Building, Chicago, Ill.

Ireland, Guy L. .... 1898.
Mechanical Engineer, 314 Crown Street, New Haven, Conn.

Jarecki, Alexander .... 1896.
Superintendent Jarecki Manufacturing Company, Limited, Erie, Pa.

Jenkins, John .... 1897.
General Manager Milton Iron Company, Milton, Pa.

Jessup, Alfred E. .... 1900.
Engineer of Tests, Treasury Department, Washington, D. C.

Jewett, J. Y. .... 1900.
Cement Inspector, Metropolitan Water Board of Massachusetts, Clinton, Mass.

Job, Robert .... 1900.
Chemist, Philadelphia & Reading Railway, Philadelphia, Pa.

Johnson, John B. .... 1899.
Dean of College of Mechanics and Engineering, University of Wisconsin, Madison, Wis.

Johnson, Wallace C. .... 1900.
Consulting Engineer, Niagara Falls, N. Y.

KEEP, WILLIAM J Superintendent Michigan Stove Company, 753 Jefferson Avenue, Detroit, Mich.	1896.
KEMP, JAMES F Professor of Geology, School of Mines, Columbia University, New York, N. Y.	1898.
KENNEDY, FRANK G., Jr Superintendent Logan Iron and Steel Company, Burnham, Mifflin County, Pa.	1899.
KENNEDY, JULIAN Consulting Engineer, Latrobe Company, Pittsburg, Pa.	1899.
KING, WILLIS L Vice-Chairman Jones & Laughlins, Limited, Pittsburg, Pa.	1899.
KINKEAD, J. F Inspector Chicago & Northwestern Railway Company, 507 Smithfield Street, Pittsburg, Pa.	1899.
KREUZPOINTNER, PAUL Engineer of Tests, Pennsylvania Railroad, Altoona, Pa.	1896.
LANDRETH, OLIN H Professor Engineering, Union College, Schenectady, N. Y.	1896.
LANZA, GAETANO Professor Theoretical and Applied Mechanics, in charge Mechanical Engineering Department, Massachusetts Institute of Technology, Boston, Mass.	1899.
LARKIN, JOHN P Engineer, 430 Endicott Building, St. Paul Minn.	1901.
LATHBURY & SPACKMAN Chemical and Physical Laboratories, 1619 Filbert Street, Philadelphia, Pa.	1898.
LATROBE STEEL COMPANY Marriot C. Smyth, President, 1200 Girard Building, Philadelphia, Pa.	1898.
LAWRENCE, WILLIAM H Assistant Professor of Architecture, Massachusetts Institute of Technology, Boston, Mass.	1901.

Lesley, Robert W .... 1898.
Vice-President American Cement Company, 22 South Fifteenth Street, Philadelphia, Pa.

Lindenthal, Gustav .... 1896.
Chief Engineer North River Bridge Company, 45 Cedar Street, New York, N. Y.

Lowe Brothers .... 1899.
Paint and Color Makers; Huston Lowe, Vice-President, Dayton, Ohio.

Loweth, Charles F .... 1900.
Engineer and Superintendent of Bridges and Buildings, C. M. & St. P. Ry., 1100 Old Colony Building, Chicago, Ill.

Lundteigen, Andreas .... 1898.
Chemist, Union City, Mich.

Maclay, William W .... 1895.
President Glens Falls Portland Cement Company, Glens Falls, N. Y.

Marburg, Edgar .... 1898.
Professor of Civil Engineering, University of Pennsylvania, Philadelphia, Pa.

March, H. J .... 1899.
Civil Engineer, 13 City Hall, Buffalo, N. Y.

*McCauley, G. M .... 1898.
Treasurer and General Manager Central Iron and Steel Company, Harrisburg, Pa.

McCauley, H. K .... 1896.
Secretary and Treasurer Altoona Iron Company, Altoona, Pa.

McKenna, Charles F .... 1896.
Chemist, 221 Pearl Street, New York, N. Y.

Meade, Richard K .... 1899.
Assistant in Chemistry, Lafayette College, Easton, Pa.

Merriman, Mansfield .... 1895.
Professor of Civil Engineering, Lehigh University, South Bethlehem, Pa.

Merritt, James S .... 1898.
Mechanical Engineer, 1028 Ridge Avenue, Philadelphia, Pa.

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* Died May 25, 1901.

Mills, Charles M Assistant Engineer in charge of Bridges, Bureau of Surveys, 418 City Hall, Philadelphia, Pa.	1900.
Mitchell, William H Engineer, 100 Broadway, New York, N. Y.	1901.
Moldenke, Richard G. G Metallurgist, Consulting Engineer, Box 432, New York, N. Y.	1896.
Morison, George S Consulting Engineer, 49 Wall Street, New York, N.Y.	1896.
Morse, Albert C General Superintendent Shelby Steel Tube Company, Shelby, Ohio.	1900.
Morton, Henry President Stevens Institute of Technology, Hoboken, N. J.	1896.
Mueser, William Civil Engineer, 13–21 Park Row, New York, N. Y.	1899.
Mutual Boiler Insurance Company 31 Milk Street, Boston, Mass.	1899.
National Tube Company Conestago Building, Pittsburg, Pa.	1900.
Neale, James Secretary Wayne Iron Works, Pittsburg, Pa.	1896.
Nelson, E Engineer, 1433 Marquette Building, Chicago, Ill.	1901.
Newberry, Spencer B Manager Sandusky Portland Cement Company, Sandusky, Ohio.	1898.
Olsen, Tinius Tinius Olsen & Company, Testing Machines, 500 North Twelfth Street, Philadelphia, Pa.	1898.
Osborn, Frank C The Osborn Engineering Company, Cleveland, Ohio.	1898.
Pease, F. N Assistant Chemist Pennsylvania Railroad, Altoona, Pa.	1896.
Philips, Nimick & Company Sligo Mills, Pittsburg, Pa.	1898.

Porter, James Madison .... 1898.
Professor of Civil Engineering, Lafayette College, Easton, Pa.

Railroad Gazette .... 1898.
H. G. Prout, Editor, 32 Park Place, New York, N. Y.

Randolph, Lingan S .... 1896.
Professor of Mechanical Engineering, Virginia Polytechnic Institute, Blacksburg, Va.

Rice, Francis S .... 1898.
Structural Engineer, S. V. Huber & Company, Rooms 702–707 Ferguson Block, Pittsburg, Pa.

Richards, Joseph T .... 1900.
Engineer Maintenance of Way, Pennsylvania Railroad, Broad Street Station, Philadelphia, Pa.

Richardson, Clifford .... 1896.
Asphalt Expert, New York Testing Laboratory, Long Island City, N. Y.

Richter, A. W .... 1900.
Assistant Professor of Experimental Engineering, 428 Murray Street, Madison, Wis.

Riehlé, Frederick A .... 1898.
Riehlé Bros. Testing Machine Company, 1424 North Ninth Street, Philadelphia, Pa.

Roebling's (John A.) Sons Co .... 1900.
Wire Manufacturers, Trenton, N. J.

Rothburg, M. E .... 1896.
Chief Chemist Cambria Steel Company, Westmont, Johnstown, Pa.

Rowland, John F., Jr .... 1898.
Professor of Mechanical Engineering, Drexel Institute, Philadelphia, Pa.

Sabin, A. H .... 1898.
Chemist, 45 Broadway, New York, N. Y.

Sauveur, Albert .... 1896.
Manager Boston Testing Laboratories, 446 Tremont Street, Boston, Mass.

Schaffer, Herbert A .... 1898.
Chemist Vulcanite Portland Cement Company, Phillipsburg, N. J.

SCHNEIDER, HERMAN .... 1900.
Instructor in Civil Engineering, Lehigh University, South Bethlehem, Pa.

SCHUMANN, FRANCIS.............................. 1898.
Civil and Mechanical Engineer, 7000 Tulip Street, Tacony, Philadelphia, Pa.

SEAMAN, HARRY J .... 1898.
Superintendent Atlas Cement Company, Catasauqua, Pa.

SHIMER, PORTER W.............................. 1899.
Chemist and Metallurgist, Lafayette College, Easton, Pa.

STAUFFER, DAVID McN .... 1896.
Civil Engineer, Editor Engineering News, 220 Broadway, New York, N. Y.

STEINMAN, A. J.............................. 1899.
Chairman Pennsylvania Iron Company, Limited, Lancaster, Pa.

STEVENSON, A. A.............................. 1896.
Assistant Superintendent Standard Steel Works, Burnham, Mifflin County, Pa.

STILLMAN, THOMAS B .... 1899.
Chemist, Stevens Institute of Technology, Hoboken, N. J.

STROBEL, CHARLES L .... 1896.
Consulting Engineer, 1744 Monadnock Block, Chicago, Ill.

SWAIN, GEORGE F.............................. 1896.
Professor of Civil Engineering, Massachusetts Institute of Technology, Boston, Mass.

TALBOT, ARTHUR N.............................. 1898.
Professor of Municipal and Sanitary Engineering, University of Illinois, Urbana, Ill.

TAYLOR, WILLIAM PERVUS.............................. 1900.
Inspector of Cement, 418 City Hall, Philadelphia, Pa.

TECHNISCHER VEREIN BROOKLYN.............................. 1896.
Bartholomew Viola, Secretary, 11 Bartlett Street, Brooklyn, N. Y.

TECHNISCHER VEREIN NEW YORK .... 1896.
Carl Kaelble, Secretary, Room 705, 290 Broadway, New York, N. Y.

Technischer Verein Philadelphia .... 1896.
534 North Fourth Street, Philadelphia, Pa.

Technischer Verein Pittsburg .... 1896.
H. W. Bernard, Secretary, 305 Penn Avenue, Allegheny, Pa.

Technischer Verein Washington .... 1896.
Paul Bausch, Corresponding Secretary, 719 Sixth Street, N. W., Washington, D. C.

Thackray, George E .... 1899.
Structural Engineer Cambria Steel Company, Johnstown, Pa.

Thomas, David .... 1900.
Assistant Superintendent, Reading Iron Company, Danville, Pa.

Thurston, Robert H .... 1896.
Director Sibley College, Cornell University, Ithaca, N. Y.

Tippett & Wood .... 1900.
Plate Iron and Steel Workers, Phillipsburg, N. J.

Vogt, A. S .... 1896.
Mechanical Engineer, Pennsylvania Railroad, Altoona, Pa.

Waddell, J. A. L .... 1896.
Consulting Civil Engineer, Kansas City, Mo.

Wagner, Samuel Tobias .... 1899.
First-Assistant Engineer, Bureau of Surveys, City Hall, Philadelphia, Pa.

Webster, George S .... 1900.
Chief Engineer and Surveyor, Bureau of Surveys, 418 City Hall, Philadelphia, Pa.

Webster, William R .... 1898.
Civil Engineer, 411 Walnut Street, Philadelphia, Pa.

West, Thomas D .... 1897.
Foundry Expert, Sharpsville, Pa.

Whitehead, J. W., Jr .... 1900.
National Lead Company, 1510 State Street, Chicago, Ill.

Wickhorst, Max H .... 1898.
Engineer of Tests, Chicago, Burlington and Quincy Railroad, Aurora, Ill.

WILLE, H. V .... 1898.
Engineer of Tests, Baldwin Locomotive Works, 500 North Broad Street, Philadelphia, Pa.

WING, CHARLES B .... 1900.
Professor of Structural Engineering, Stanford University, Cal.

WOOD, WALTER.. 1900.
Cast Iron Pipe Manufacturer, R. D. Wood Company, 400 Chestnut Street, Philadelphia, Pa.

WOOLSON, IRA H .... 1900.
Instructor in Mechanical Engineering, Columbia University, New York, N. Y.

BY-LAWS OF THE AMERICAN SECTION.

Adopted August 27, 1898.
Revised October 26, 1900.

ARTICLE 1.—The name of this organization shall be the "American Section of the International Association for Testing Materials."

ARTICLE 2.—The objects of the American Section shall be to unite more closely those members of the International Association living on the Western Continent, and to cooperate in the promotion of the purposes of this Association.

ARTICLE 3.—Each member shall pay on the first of January of each year, to the Secretary of the American Section, the sum of $2.50, annual dues for the current year.

Of this amount, $1.50 shall be transmitted to the International Association by the Treasurer of the American Section, and the remainder shall be used to defray the expenses of the American Section.

Any member of the American Section whose dues shall remain unpaid for the period of one year shall be reported to the Council of the International Association.

ARTICLE 4.—The officers of the American Section shall be a Chairman, Vice-Chairman, Secretary, and Treasurer, who shall hold office for two years.

The Executive Committee shall consist of these officers together with two members, one being elected at each Annual Meeting, and each of them serving for two years.

The chairman shall be, *ex-officio*, the nominee for American Member of the Council of the International Association.

ARTICLE 5.—The American Section shall meet annually. The time and place of each meeting shall be fixed by the Executive Committee.

Special meetings shall be called whenever the Executive Committee shall deem it necessary.

Process of Manufacture.

1. Wrought iron shall be made by the puddling or by the charcoal hearth process or rolled from fagots or piles made from wrought iron scrap, alone or with muck bar added.

INTERNATIONAL

ASSOCIATION FOR TESTING MATERIALS.

AMERICAN SECTION.

BULLETIN NO. 24. JUNE, 1901.

REVISED STANDARD SPECIFICATIONS

FOR

WROUGHT IRON.

Recommended by American Branch of Committee No. 1, to Replace
those in Bulletin No. 17. To be Discussed at the
Annual Meeting at Niagara Falls,
N. Y., June 29, 1901.

Process of Manufacture.

1. Wrought iron shall be made by the puddling process or rolled from fagots or piles made from wrought iron scrap, alone or with muck bar added.

Physical Properties.

Tensile Test. 2. The minimum physical qualities required in the four classes of wrought iron shall be as follows:

	Stay-bolt iron.	Merchant iron. Grade "A."	Merchant iron. Grade "B."	Merchant iron. Grade "C."
Tensile strength, pounds per sq. inch	46,000	50,000	48,000	48,000
Yield point, pounds per sq. inch	25,000	25,000	25,000	25,000
Elongation, per cent. in 8 inches	28	25	20	20

3. In sections weighing less than 0.654 pound per lineal foot, the percentage of elongation required in the four classes specified in paragraph No. 2 shall be 12 per cent., 15 per cent., 18 per per cent., and 21 per cent., respectively.

Nicking Test.

4. The four classes of iron when nicked and tested as described in paragraph No. 9 shall show the following fracture:

(*a*) Stay-bolt iron, a long, clean, silky fiber, free from slag or dirt, and wholly fibrous, being practically free from crystalline spots.

(*b*) Merchant iron, Grade "A," a long, clean, silky fiber, free from slag or dirt or any coarse crystalline spots. A few fine crystalline spots may be tolerated, provided they do not in the aggregate exceed 10 per cent. of the sectional area of the bar.

(*c*) Merchant iron, Grade "B," a generally fibrous fracture, free from coarse crystalline spots. Not over 10 per cent. of the fractured surface shall be granular.

(*d*) Merchant iron, Grade "C," a generally fibrous fracture, free from coarse crystalline spots. Not over 15 per cent. of the fractured surface shall be granular.

Cold Bending Test.

5. The four classes of iron, when tested as described in paragraph No. 10, shall conform to the following bending tests:

(*e*) Stay-bolt iron, a piece of stay-bolt iron about 24 inches long shall bend in the middle through 180° flat on itself, and then bend in the middle through 180° flat on itself in a plane at a right angle to the former direction, without a fracture on outside of the bent portions. Another specimen with a thread cut over the entire length shall stand this double bending without showing deep cracks in the threads.

(*f*) Merchant iron, Grade "A," shall bend cold 180° flat on itself without fracture on outside of the bent portion.

(*g*) Merchant iron, Grade "B," shall bend cold 180° around a diameter equal to the thickness of the tested specimen, without fracture on outside of the bent portion.

(*h*) Merchant iron, Grade "C," shall bend cold 180° around a diameter equal to twice the thickness of the specimen tested, without fracture on outside of the bent portion.

Hot Bending Test.

6. The four classes of iron, when tested as described in paragraph No. 11, shall conform to the following hot bending tests:

(*i*) Stay-bolt iron, shall bend through 180° flat on itself, without showing cracks or flaws. A similar specimen heated to a yellow heat and suddenly quenched in water between 80° and 90° F. shall bend, without hammering on the bend, 180° flat on itself without showing cracks or flaws.

(*j*) Merchant iron, Grade "A," shall bend through 180° flat on itself, without showing cracks or flaws. A similar specimen heated to a yellow heat and suddenly quenched in water between 80° and 90° F. shall bend, without hammering on the bend, 180° flat on itself without showing cracks or flaws. A similar specimen heated to a bright red heat shall be split at the end and each part bent back through an angle of 180°. It will also be punched and expanded by drifts until a round hole is formed whose diameter is not less than nine-tenths of the diameter of the rod or width of the bar. Any extension of the original split or indications of fracture, cracks, or flaws developed by the above tests will be sufficient cause for the rejection of the lot represented by that rod or bar.

(*k*) Merchant iron, Grade "B," shall bend through 180° flat on itself, without showing cracks or flaws.

(*l*) Merchant iron, Grade "C," shall bend sharply to a right angle, without showing cracks or flaws.

Threading Test.

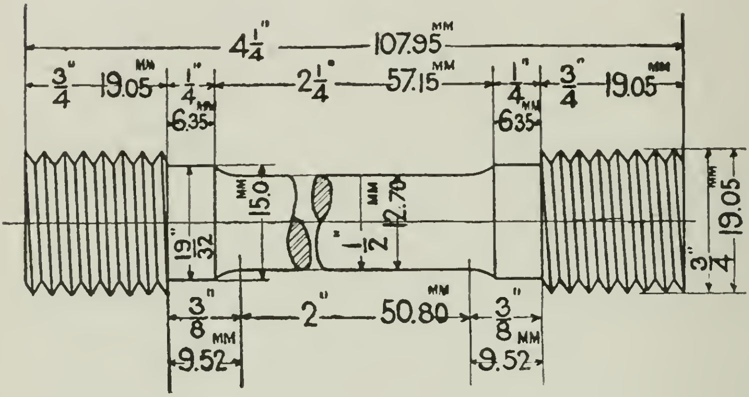
7. Stay-bolt iron shall permit of the cutting of a clean sharp thread and be rolled true to gauges desired, so as not to jam in the threading dies.

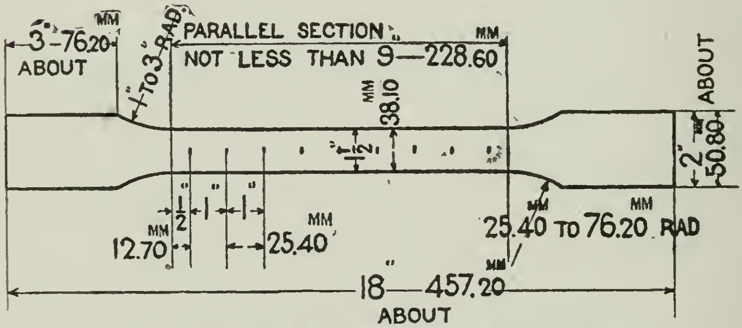
TEST PIECES AND METHODS OF TESTING.

Test Specimen for Tensile Test.

8. Whenever possible, iron shall be tested in full size as rolled, to determine the physical qualities specified in paragraphs Nos. 2 and 3, the elongation being measured on an eight inch (8″) gauged length. In flats and shapes too large to test as rolled, the standard test specimen shall be one and one-half inches (1 1/2″) wide and eight inches (8″) gauged length.

In large rounds, the standard test specimen of two inches (2") gauged length shall be used; the center of this specimen shall be half way between the center and outside of the round. Sketches of these two standard test specimens are as follows:





PIECE TO BE OF SAME THICKNESS AS THE PLATE.

9. Nicking tests shall be made on specimens cut from the iron as rolled. The specimen shall be slightly and evenly nicked on one side and bent back at this point through an angle of 180° by a succession of light blows.

Nicking Tests.

Cold Bending Tests.

10. Cold bending tests shall be made on specimens cut from the bar as rolled. The specimen shall be bent through an angle of 180° by pressure or by a succession of light blows.

Hot Bending Tests.

11. Hot bending tests shall be made on specimens cut from the bar as rolled. The specimens, heated to a bright red heat, shall be bent through an angle of 180° by pressure or by a succession of light blows and without hammering directly on the bend.

If desired, a similar bar of any of the four classes of iron shall be worked and welded in the ordinary manner without showing signs of red shortness.

Yield Point.

12. The yield point specified in paragraph No. 2 shall be determined by the careful observation of the drop of the beam or halt in the gauge of the testing machine.

FINISH.

13. All wrought iron must be practically straight, smooth, free from cinder spots or injurious flaws, buckles, blisters or cracks.

In round iron, sizes must conform to the Standard Limit gauge as adopted by the Master Car Builders' Association in November, 1883.

INSPECTION.

14. Inspectors representing the purchasers, shall have all reasonable facilities afforded them by the manufacturer to satisfy them that the finished material is furnished in accordance with these specifications. All tests and inspections shall be made at the place of manufacture, prior to shipment.

INTERNATIONAL

ASSOCIATION FOR TESTING MATERIALS.

AMERICAN SECTION.

BULLETIN NO. 25. JUNE, 1901.

REPORT OF COMMITTEE NO. 1.

PHILADELPHIA, PA., June —, 1901.

To the American Section of the International Association for Testing Materials:

The last report made by this Committee, contained in Bulletins Nos. 18 and 20, was read at the Third Annual Meeting of the American Section of the International Association for Testing Materials, October 25–27, 1900. The Chairman had the pleasure of presenting for discussion at this Third Annual Meeting, ten Proposed Standard Specifications which had been adopted by a letter ballot of the full membership of the American Branch of Committee No. 1, and which had been printed and distributed to all Members of the American Section, prior to the Third Annual Meeting. These Proposed Specifications were contained in Bulletins Nos. 8–17, inclusive.

The Secretary of the Publication Committee reported at the Third Annual Meeting that he had furnished the following Societies copies of these Bulletins, and had requested that the Proposed Specifications be made the subject of discussion at the meetings of these Societies.

American Society of Civil Engineers.
American Society of Mechanical Engineers.
American Institute of Mining Engineers.
Master Car Builders' Association.
American Railway Master Mechanics' Association.
American Association for the Advancement of Science.

In addition to the publicity thus gained for these Specifications proposed by Committee No. 1, the American Technical Press, during the spring and summer of 1900, devoted considerable space to their discussion.

The Chairman also takes pleasure in stating that one of the Members of Committee No. 1, Mr. Albert Ladd Colby, wrote an elaborate Review of the American Methods of Testing Iron and Steel, and the Specifications proposed as Standards by this Committee. This Review was presented, with the authority of the Executive Committee of the American Section, before the International Congress on Testing Materials, held in Paris, July, 1900. The author had a large edition of his paper published in English, French, and German, and the Chairman takes particular pleasure in recording the fact that this paper created more discussion than any other paper presented at the Paris Congress.

As a further evidence of the International interest taken in the work of the American Branch of Committee No. 1, it may also be stated that the Council of the Iron and Steel Institute, shortly after the Paris Congress, requested the author of this Review to prepare another synopsis of the Proposed American Standard Specifications for Iron and Steel for the Paris Meeting of the Iron and Steel Institute, held in September, 1900. At this meeting also the Proposed American Specifications brought forth an interesting discussion, and also a vote of thanks from the Institute to the author.

This brief summary indicates the International interest that has been taken in the work of the American Branch of Committee No. 1, during 1900.

On a recent visit of the Chairman to England and the Continent, he had the pleasure of meeting several members of International Committee No. 1, and in all cases found that the work of the American Branch had been highly appreciated.

By referring to Bulletin No. 21, the members not present at the Third Annual Meeting of the American Section will note that the discussion of the Proposed Standard Specifications occupied six sessions of the meeting, and that they were all referred back to the Committee, and in certain cases changes were suggested. Since the Annual Meeting, individual members of Committee No. 1 have suggested certain other revisions.

All these revisions were made the subject of careful discussion at a meeting of Committee No. 1, held in Philadelphia, May 3d, and the action taken on the revisions proposed in the Specifications were incorporated in a circular which was mailed, together with a copy of Bulletins Nos. 8–17, to each of the 33 members of Committee No. 1, with the request for a letter ballot as to whether the Specifications, as revised, were or were not representative of good American practice. The following summary of this ballot shows that the Specifications, as revised, were adopted by a large majority of the full membership of Committee No. 1, and are now offered at this Fourth Annual Meeting of the American Section for consideration and action.

			For.	Against.
Bulletin No.	8	Structural Steel for Bridges and Ships	28	1
"	9	Structural Steel for Buildings	29	0
"	10	Open-Hearth Boiler Plate and Rivet Steel	29	0
"	11	Steel Rails	29	0
"	12	Steel Splice Bars	29	0
"	13	Steel Axles	28	1
"	14	Steel Tires	29	0
"	15	Steel Forgings	29	0
"	16	Steel Castings	29	0
"	17	Wrought Iron	28	1

Declined to vote, 1. Not heard from, 3.

WM. R. WEBSTER,
EDGAR MARBURG.

Date, June 12, 1901.

It is the opinion of those Members of Committee No. 1, who have taken the most active share of the work in the preparation of these Proposed Standard Specifications, that the American Section cannot do better than endorse the work of their Committee No. 1 and adopt these Specifications as American Standards. The Committee can then be continued to take up the standardization of Specifications for other Iron and Steel materials not as yet covered, for instance, Tubes, Wire, Cast Iron Pipe, Springs, etc.

By the time that the Committee has finished their report and suggested a Standard Specification for these new materials, it will probably be necessary for them to take up some of the Specifications now submitted and revise them, for it is thoroughly appreciated that in the rapid advances made in the processes of manufacture, and the increased demands made by the Engineers in their Specifications, that no Standard Specification can be in force for a long period. It will of necessity have to be modified from time to time.

REPORT ON THE STANDARD TURNED TEST SPECIMEN OF 1/2" DIAMETER AND 2" GAUGED LENGTH.

During the discussion of the Specifications at the last Annual Meeting of this American Section, your Committee No. 1 was requested to submit a report at the next Annual Meeting, giving the reasons which had led them to recommend a test specimen of 2" gauged length, for determining the physical properties of Steel Axles, Steel Tires, Steel Forgings, and Steel Castings, and for testing large rounds of Wrought Iron, rather than a test specimen of an 8" or 10" gauged length, and to show the relation between the same materials tested in bars of the different sizes. The Chairman of the Committee appointed Mr. Albert Ladd Colby as a Committee on this subject, who has presented the following report :

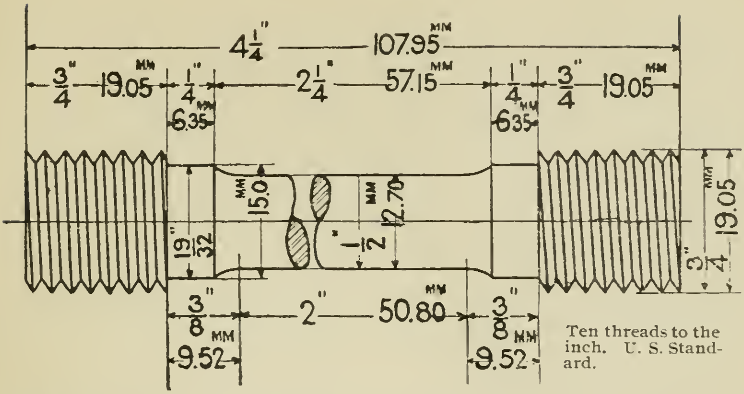
SOUTH BETHLEHEM, PA., May 1, 1901.

Mr. Wm. R. Webster, Chairman American Branch of Committee No. 1.

"During the discussion of the Specifications at the Annual Meeting of the American Section, Committee No. 1 was requested to submit a report at the next Annual Meeting, giving the reasons which had led them to recommend a Test Specimen of 2" Gauged Length for determining the Physical Properties of Steel Axles, Steel Tires, Steel Forgings, and Steel Castings, and for testing large rounds of Wrought Iron, rather than one of 8" or 10" gauged length.

"You appointed me a Committee on this subject, and I take pleasure in submitting the following report :

"Much may be said in favor of the general adoption of the test specimen, shown in the following cut, of a gauged length of four diameters, for the commercial testing of these four classes of steel.



Ten threads to the inch. U. S. Standard.

"With Axles and all Steel Forgings a much shorter prolongation of the Forging is required for a longitudinal specimen of the above length than for a test specimen of eight-inch (8″) gauged length. The shorter specimen, therefore, requires the manufacturer to consign much less good metal to scrap, an item of considerable importance to the customer in the case of Forgings of large diameters.

"Furthermore less time and labor is expended in cutting out and machining the shorter test specimen. At a given cost a much better idea of the quality of the metal can therefore be obtained, for several short specimens can be taken at different positions in an important Casting or Forging at the same cost for preparation as one long specimen.

"The shorter specimen has also the great advantage of enabling the customer to determine the character of the material at places in a complicated Casting or Forging where there is not space enough for a longer specimen, as between the webs of crank shafts. In the case of Steel Tires the shorter specimen is greatly preferable, for when cut from the rim of the tire used for the drop test, the longer specimen can very seldom be obtained unless the Tire is heated and straightened, an operation which at once destroys its value as a representative test of the finished Tires of the melt.

"Finally the physical properties called for in the Specifications for Steel Castings, Steel Axles, Steel Forgings, and Steel Tires can be accurately and readily determined when using the standard test specimen recommended. For in cases where Elastic Limit is specified instead of Yield Point, an apparatus reading to the one-ten-thousandth of an inch (0.0001″) can be easily attached and readings readily made. The determination of the Tensile Strength is not materially affected by the length of the specimen. The percentage of Contraction of Area and the quality of the fracture, both very important factors in determining the quality of the metal, are shown with equal accuracy and distinctness with the shorter specimen, as with one of greater length. The higher percentages of Elongation obtained on two inches (2″) are compensated for by having correspondingly higher requirements in the Specifications.

"In proof of the above assertions, the writer submits the following table, showing a series of comparative tests made with much care on the 300,000 pound Emery Hydraulic Testing Machine used by the Bethlehem Steel Company. In each case the tests were threaded on both ends and the Elastic Limit made with an electric micrometer.

" COMPARISON OF THE PHYSICAL PROPERTIES OF STEEL FORGINGS DETERMINED ON TEST BARS OF TWO-INCH (2″) AND OF TEN-INCH (10″) GAUGED LENGTH.

Character of Forgings	Tensile Strength, lbs. per sq. inch.		Elastic Limit. lbs. per sq. in.		Extension in 2″ and 10″.		Cont. of Area.	
	2″ Bar	10″ Bar	2″ Bar	10″ Bar	2″ Bar	10″ Bar	2″ Bar	10″ Bar
					Per cent.	Per cent.	Per cent.	Per cent.
Engine Forgings .	86,580	88,800	49,910	50,220	28.00	17.00	58.00	51.04
Crank Web.......	81,490	79,820	49,910	46,210	30.00	22.70	58.00	51.70
Link Beam Pin...	93,200	90,390	60,090	59,320	27.00	19.60	59.96	56.83
Crank Pin........	90,650	88,980	60,090	62,120	28.00	20.00	62.53	60.91
Engine Forgings .	91,670	89,740	59,080	62,370	28.50	18.00	60.55	55.63
Crank Web.......	84,030	82,860	53,980	51,940	27.00	24.30	51.55	56.44
Crank Web.......	89,120	86,440	53,980	53,200	27.00	21.30	54.83	53.06
Pin	94,600	94,330	60,330	62,880	26.00	19.80	52.73	51.28
Crosshead Pins and Collars.........	89,630	87,820	55,000	52,440	27.00	19.80	49.29	46.56
Main Shaft and Eccentric Rod..	89,990	91,530	52,150	56,520	25.50	20.00	46.48	49.30
Engine Forgings .	91,670	89,880	63,150	62,500	26.00	21.00	49.57	50.72
Engine Forgings .	92,180	91,020	62,130	61,980	26.50	19.80	47.57	44.65
Piston Rod.......	90,140	85,290	51,950	52,950	27.00	19.00	58.00	55.77

(Signed) ALBERT LADD COLBY."

It was the sense of the Meeting of Committee No. 1, held on May 3, 1901, that this Report proves conclusively that no just criticism could be made of the Committee's action in adopting the Test Specimen of 2″ Gauged Length, provided correspondingly higher requirements in percentages of elongation were specified, and the requirements mentioned in the various Specifications showed that this had been the case. A motion was carried accepting Mr. Colby's Report, and the committee was discharged with the thanks of Committee No. 1.

Your Chairman has recently carried on an active correspondence with Herr Rieppel, Chairman of International Committee No. 1, and also had the pleasure recently of a personal interview with M. Alpherts, Vice-chairman of the International Committee No. 1, and has to report that they thoroughly approve of the manner in which the work of the American Branch of Committee No. 1 has been carried out, and that in place of sending Herr Rieppel a large number of individual Specifications on the blanks originally furnished by him, that all he now wants is the Proposed American Standard Specifications filled out on his tables.

The Specifications now offered for discussion and action at this Annual Meeting have already been arranged on the blank tables furnished by Herr Rieppel and have been forwarded to him, with the understanding that if any changes were made at this Annual Meeting, that he would be promptly notified. From this you can see the importance of our taking definite action at this meeting in order that our work may be properly considered at the Buda-Pesth Congress of the International Association for Testing Materials, in September, next.

(Signed) WM. R. WEBSTER,
Chairman American Branch of Committee No. 1.

INTERNATIONAL

ASSOCIATION FOR TESTING MATERIALS.

AMERICAN SECTION.

BULLETIN No. 26. JULY, 1901.

LETTER BALLOT ON SPECIFICATIONS.

Each member is requested to vote, using the accompanying postal card, as to whether the Specifications for Steel and Wrought Iron, adopted by Committee No. 1, in June, and revised and adopted at the Fourth Annual Meeting, on June 29, 1901, shall be, or shall not be, adopted by the American Section as standards representing, in its opinion, the best average American practice at the present time.

Copies of Bulletins Nos. 8, 9, 10, 11, 12, 13, 14, 15, 16, and 24, containing the Specifications as revised and adopted at the Fourth Annual Meeting, accompany this Bulletin.

Ballots will be canvassed at noon on August 10th. Those received by the Secretary after that time will not be counted. All members are requested to vote.

This letter ballot is authorized by the following resolutions, which were unanimously adopted at the Fourth Annual Meeting:

Whereas, The report of the Chairman of the American Branch of Committee No. 1, presented at this meeting, and published in Bulletin No. 25, shows that his sub-committees, in drafting the ten proposed standard Specifications, carefully collected, tabulated, and studied the existing American Specifications for each class of material; and

Whereas, each Specification proposed as a standard by this Committee has been endorsed by letter ballot by a large majority of its thirty-four members, as representative of good American practice and as insuring the delivery of a satisfactory material; and further,

Whereas, The Chairman of the International Committee No. 1 is now issuing a circular to all national branches of Committee No. 1 asking them to adopt a standard Specification for each class of material, and to send it to him prior to Buda Pesth Congress in September, 1901;

Therefore, be it Resolved, That the American Section of the International Association for Testing Materials hereby adopts as standards the ten Specifications as published in the revised Bulletins Nos. 8 to 16 and No. 24, and as revised and accepted at this meeting, this adoption being subject to ratification by seventy per cent. of the votes to be cast by letter ballot by the members of the American Section;

Resolved, That, if thus ratified, these Resolutions and these Specifications be reported to the Buda Pesth Congress by the Chairman of the American Section.

INTERNATIONAL

ASSOCIATION FOR TESTING MATERIALS.

AMERICAN SECTION.

BULLETIN No. 27. AUGUST, 1901.

FOURTH ANNUAL MEETING.

The Fourth Annual Meeting of the American Section of the International Association for Testing Materials was held at Niagara Falls, N. Y., on June 29, 1901. The following members and guests were present:

American Foundrymen's Association, represented by R. G. G. Moldenke.
Frederick Brooks, Civil Engineer, Boston, Mass.
H. H. Campbell, Pennsylvania Steel Co., Steelton, Pa.
Albert Ladd Colby, Bethlehem Steel Company, South Bethlehem, Pa.
T. L. Condron, Pittsburg Testing Laboratory, Chicago, Ill.
William F. M. Goss, Purdue University, Lafayette, Ind.
Edward M. Hagar, Cement Department, Illinois Steel Company, Chicago, Ill.
W. Kendrick Hatt, Purdue University, Lafayette, Ind.
Charles S. Hill, Engineering News, New York, N. Y.
Henry M. Howe, Columbia University, New York, N. Y.
Richard L. Humphrey, Buckhorn Portland Cement Company, Philadelphia, Pa.
Illinois Steel Company, represented by P. E. Carhart.
Gaetano Lanza, Massachusetts Institute of Technology, Boston, Mass.
Mansfield Merriman, Lehigh University, South Bethlehem, Pa.
J. M. Porter, Lafayette College, Easton, Pa.
Arthur N. Talbot, University of Illinois, Champaign, Ill.
George E. Thackray, Cambria Steel Company, Johnstown, Pa.
William R. Webster, Inspecting Engineer, Philadelphia, Pa.
Max H. Wickhorst, Chicago, Burlington & Quincy Railroad, Aurora, Ill.

The Chairman, Prof. Henry M. Howe, called the meeting to order in the International Hotel, at 10 A.M.

ADDRESS BY THE CHAIRMAN.

In this weather, and with the attractions of the Pan-American

Exposition competing, to inflict upon you a long address would be a poor return for the compliment you have paid me in calling me to preside over your deliberations. I shall, therefore, be very brief, especially as what I have to say is addressed rather to those who are not here than to those who are.

I wish to call your attention, and more particularly theirs, to the public utility and beneficence of our work.

That an invention which lowers the cost and eventually lowers the price of a staple commodity is a public benefit, is of course clear. It effects a saving to every user of that commodity, to every user of *anything made out of* that commodity, to every user of *anything made with* that commodity, and to every user of anything made *with or out of any other thing* which in turn is made *with or out of* that commodity. In case of the great staple articles, the great textile fabrics, the chief materials of construction, this means that it effects a saving to every class in the community, the laborer, the farmer, the salaried man, the professional man, the millionaire. In case of the spinning jenny, the cotton gin, the mariner's compass, the railway, it is superfluous to insist: every class, perhaps every man, has a saving effected by these great inventions, and that saving, pace my friends who think that a cheap coat makes a cheap wearer, is a benefit to each and every class, because that saving enables it to divert just so much of its wages, or salary, or income, to provision for old age or to better and more comfortable support, better education, better surroundings for the family; that saving enables each family to surround itself with more beautiful and uplifting surroundings, to live on better food and in more sanitary conditions.

But manufacturing is not the only cost. There are also the cost of transportation, and the commercial costs, the labor of the enormous army of men engaged in bringing about the transfer from seller to buyer. And anything which lessens the cost, the labor, the friction of either of these divisions of the final cost to the consumer, in like manner benefits the community by lowering the cost and thereby eventually lowering the price, and thereby in turn widening, bettering, uplifting the scale of the family life.

Our work is in effect to lessen the friction of the sale of the great materials of construction, and thus to do our share in lowering the cost and eventually the price of those materials. And since every class must use things made with or by, or transported with or by, these materials, our work makes, in the way which I have sketched, for the bettering, the widening, the uplifting of the family life and the family surroundings of every class.

To our country our work should be of unusual and very direct, special value. We aim to unify the methods of testing materials of construction throughout the world, and thereby greatly to facilitate our export trade in those materials, and thereby to offset the disadvantage of our relatively isolated geographical position.

In view of these considerations, of the value and the possibilities of our work, the plan is under serious consideration of endeavoring, through a clear exposition of the matter to the great consuming and manufacturing industries, to place our finances on a much broader and firmer footing, with a view to making our work more effective, and of increasing greatly its value, immediately to those industries and indirectly to the community as a whole.

Appointment of Auditors.

The Chairman appointed Messrs. William R. Webster and Richard G. G. Moldenke as auditors, and announced that the reports of officers would be presented at the end of the session.

Report of Committee No. 1.

Mr. Webster called attention to the report of his Committee as printed in Bulletin No. 25, and said that he had recently received a letter from Mr. Rieppel, Chairman of the International Committee No. 1, stating that he is about to send out a circular to the chairmen of the National Committees in each country suggesting that at the Buda Pesth Congress, or before that time, they formulate what they consider the representative specifications for each class of material. In other words, the work of the American Committee is to be taken rather as a model by the other countries.

The changes in the specifications proposed by the Committee and adopted by letter ballot of its members were ready for consideration by this meeting, as shown by stickers pasted in copies of the Bulletins Nos. 8, 9, 10, 11, 12, 13, 14, 15, and 16, while the changes for Bulletin No. 17 were so numerous that it has been reprinted as Bulletin No. 24.

On motion, the report of Committee No. 1 was accepted, and it was decided to proceed to the consideration of the separate specifications.

SPECIFICATIONS FOR STRUCTURAL STEEL.

The changes proposed by Committee No. 1 in Bulletin No. 9, were then read by the Secretary as follows :

4.

Tensile Tests.

	Rivet steel.	Medium steel.
Tensile strength, pounds per square inch........................	50,000 to 60,000	60,000 to 70,000
Yield point, in pounds per square inch shall not be less than.....	1/2 T. S.	1/2 T. S.
Elongation, per cent. in eight inches shall not be less than..........	26	22

Test Specimen for Bending.

9. One test specimen for bending shall be taken from the finished material of each melt or blow as it comes from the rolls and for material three-fourths inch ($^3/_4''$) and less in thickness this specimen shall have the natural rolled surface on two opposite sides. The bending test specimen shall be one and one-half inches (1 $^1/_2''$) wide, if possible, and for material more than three-fourths inch ($^3/_4''$) thick the bending test specimen may be one-half inch ($^1/_2''$) thick. The sheared edges of bending test specimens may be milled or planed.

Annealed Test Specimens.

10. Material which is to be used without annealing or further treatment shall be tested for tensile strength in the condition in which it comes from the rolls. Where it is impracticable to secure a test specimen from material which has been annealed or otherwise treated, a full-sized section of tensile test specimen length, shall be similarly treated before cutting the tensile test specimen therefrom.

13. The variation in cross section or weight of more than 2$^1/_2$ per cent. from that specified will be sufficient cause for rejection, except in the case of sheared plates, which will be covered by the following permissible variations :

(*g*) Plates 12$^1/_2$ pounds per square foot or heavier, up to 100 inches wide, when ordered to weight, shall not average more than 2$^1/_2$ per cent. variation above or 2$^1/_2$ per cent. below the theoretical weight. When 100 inches wide and over 5 per cent. above or 5 per cent. below the theoretical weight.

(*h*) Plates under $12^1/_2$ pounds per square foot, when ordered to weight, shall not average a greater variation than the following:

Up to 75 inches wide, $2^1/_2$ per cent. above or $2^1/_2$ per cent. below the theoretical weight. 75 inches wide up to 100 inches wide, 5 per cent. above or 3 per cent. below the theoretical weight. When 100 inches wide and over 10 per cent. above or 3 per cent. below the theoretical weight.

(*i*) For all plates ordered to guage, there will be permitted an average excess of weight over that corresponding to the dimensions on the order equal in amount to that specified in the following table:

TABLE OF ALLOWANCES FOR OVERWEIGHT FOR RECTANGULAR PLATES WHEN ORDERED TO GAUGE.

Plates will be considered up to gauge if measuring not over $^1/_{100}$ inch less than the ordered gauge.

The weight of 1 cubic inch of rolled steel is assumed to be 0.2833 pound.

On motion the specifications for structural steel for buildings, as thus amended, were accepted.

The specifications for structural steel for bridges and ships, as contained in Bulletin No. 8, had been amended by Committee No. 1 in exactly the same manner as those of No. 8. These specifications, as amended, were on motion accepted by the meeting.

SPECIFICATIONS FOR OPEN-HEARTH BOILER PLATE AND RIVET STEEL.

These specifications, as printed in Bulletin No. 10, had been amended by Committee No. 1 as follows:

2. There shall be three classes of open-hearth boiler plate and rivet steel, namely, FLANGE OR BOILER STEEL, FIRE BOX STEEL and EXTRA SOFT STEEL, which shall conform to the following limits in chemical composition:

	Flange or Boiler steel. Per cent.	Fire box steel. Per cent.	Extra soft steel. Per cent.
Phosphorus shall not exceed…	Acid 0.06 Basic 0.04	Acid 0.04 Basic 0.03	0.04
Sulphur shall not exceed…….	0.05	0.04	0.04
Manganese…………………	0.30 to 0.60	0.30 to 0.50	0.30 to 0.50

4. The three classes of open-hearth boiler plate end rivet steel, namely, FLANGE OR BOILER STEEL, FIRE BOX STEEL and EXTRA SOFT SEEEL, shall conform to the following physical qualities:

Tensile Tests.

	Flange or boiler steel.	Fire box steel.	Extra soft steel.
Tensile strength, pounds per square inch.....	55,000 to 65,000	52,000 to 62,000	45,000 to 55,000
Yield point, in pounds per square inch shall not be less than....	½ T. S.	½ T. S.	½ T. S.
Elongation, per cent. in eight inches shall not be less than........	25	26	28

Test Specimens for Bending.

10. For material three-fourths inch ($^3/_4''$) or less in thickness, the bending test specimen shall have the natural rolled surface on two opposite sides. The bending test specimens cut from plates shall be one and one-half inches ($1^1/_2''$) wide and for material more than three-fourths inch ($^3/_4''$) thick the bending test specimens may be one-half inch ($^1/_2''$) thick. The sheared edges of bending test specimens may be milled or planed. The bending test specimens for rivet rounds shall be of full size as rolled. The bending test may be made by pressure or by blows.

15. The variation in cross section or weight of more than $2^1/_2$ per cent. from that specified will be sufficient cause for rejection, except in the case of sheared plates, which will be covered by the following permissible variations:

(*e*) Plates $12^1/_2$ pounds per square foot or heavier, up to 100 inches wide, when ordered to weight, shall not average more than $2^1/_2$ per cent. variation above or $2^1/_2$ per cent. below the theoretical weight. When 100 inches wide and over 5 per cent. above or 5 per cent. below the theoretical weight.

(*f*) Plates under $12^1/_2$ pounds per square foot, when ordered to weight, shall not average a greater variation than the following:

Up to 75 inches wide, $2^1/_2$ per cent. above or $2^1/_2$ per cent. below the theoretical weight. 75 inches wide up to 100 inches wide, 5 per cent. above or 3 per cent. below the theoretical weight. When 100 inches wide and over 10 per cent. above or 3 per cent. below the theoretical weight.

(*g*) For all plates ordered to gauge, there will be permitted an average excess of weight over that corresponding to the dimensions on the order equal in amount to that specified in the following table:

TABLE OF ALLOWANCES FOR OVERWEIGHT FOR RECTANGULAR PLATES WHEN ORDERED TO GAUGE.

Plates will be considered up to gauge if measuring not over $^1/_{100}$ inch less than the ordered gauge.

The weight of 1 cubic inch of rolled steel is assumed to be 0.2833 pound.

Mr. Wickhorst called attention to the fact that no provision was made for the percentage of carbon, which he regarded as very important in fire-box steel. Mr. Colby replied that, on account of the limitations in manganese, phosphorus, and in tensile strength, the carbon could hardly vary outside of 0.15 to 0.25 per cent. Mr. Campbell said that the limits of carbon, if such were stated, should be different for acid steel and basic steel. After some further discussion the chairman put the question on the acceptance of the specifications as amended and it was so voted.

Specifications for Steel Rails.

Committee No. 1 recommended that the specifications as printed in Bulletin No. 11, be adopted without change.

Prof. Merriman asked if the committee had considered the question of introducing a ductility test. Mr. Webster replied that the committee had decided not to specify the amount of deflection in the drop test, as sufficient data were not at hand.

Mr. Wickhorst suggested that the report of the drop test ought to give the temperature at which the test had been made. After a lengthy discussion by Messrs. Campbell, Hatt, Howe, Lanza, Webster and Wickhorst, it was voted that Section 3 of Bulletin No. 11 be amended by adding the following :

"A report of results of tests shall include a record of the atmospheric temperature at the time of the tests."

On motion the specifications for steel rails, as amended, were accepted.

Specifications for Steel Splice Bars.

Committee No. 1 recommended that Section 10 of these specifications, as printed in Bulletin No. 12, be amended as follows :

10. All splice bars shall be smoothly rolled and true to templet. The bars shall be sheared accurately to length and free from fins or cracks, and shall perfectly fit the rails for which they are intended. The punching and notching shall accurately conform in every respect to the drawing and dimensions furnished. A variation in weight of more than $2^1/_2$ per cent. from that specified will be sufficient cause for rejection.

On motion "fins or cracks" was changed to "fins and cracks," and the specifications as thus amended were then accepted.

SPECIFICATIONS FOR STEEL AXLES.

The only change recommended by Committee No. 1 was a revision of Section 8 of Bulletin No. 13, as follows:

Number and Location of Tensile Specimens.

8. For driving axles one longitudinal test specimen shall be cut from one axle of each melt. The centre of this test specimen shall be half way between the center and outside of the axle.

After discussion Section 9 was amended by adding the following:

"A report of the results of tests shall include a record of the atmospheric temperature at the time of the tests."

The specifications as thus amended were then accepted by vote of the meeting.

SPECIFICATIONS FOR STEEL TIRES.

These specifications, as printed in Bulletin No. 14, were recommended by Committee No. 1 for adoption without change. On motion, they were so accepted.

SPECIFICATIONS FOR STEEL FORGINGS.

These specifications, as printed in Bulletin No. 15, were recommended by Committee No. 1 for adoption without change.

Mr. Colby moved that the last line of Section 2 be changed from "nickel shall not exceed 3.75 per cent." to "nickel, from 3 to 4 per cent." After discussion by Messrs. Campbell, Colby, and Webster, this motion was passed. The meeting then voted to accept the specifications as amended.

SPECIFICATIONS FOR STEEL CASTINGS.

These specifications, as printed in Bulletin No. 16, were recommended by Committee No. 1 for adoption without change. Dr. Moldenke called attention to the fact that the American Foundrymen's Association had recently adopted a specification for cast iron based on that in Bulletin No. 16.

On motion, the specifications were then accepted without change.

SPECIFICATIONS FOR WROUGHT IRON.

These specifications, as printed in Bulletin No. 24, were then taken up. The chairman pointed out that Section No. 1 would exclude the greater part of the Swedish wrought iron, most of it being made by the charcoal-hearth process. After discussion by Messrs. Campbell, Colby, Howe, Moldenke, and Webster it was ordered that Section 1 be amended by inserting the words "or out of pig iron by the knobbling process."

A typographic error in the last two lines of Section 3 was corrected, namely, that the percentages should be "21, 18, 15, and 12," instead of "12, 15, 18, and 21."

On motion, the specifications, as amended, were then accepted.

Standard Two-inch Test Specimen.

Mr. Webster called attention to the work done by Mr. Colby in comparing the 2-inch tensile specimen with the specimen of 10-inch gauged length, as printed in Bulletin No. 25, and said that the records show that it is perfectly feasible to secure good results from the 2-inch bar, which had been recommended by the Committee as a standard in the specifications for steel castings, forgings, axles, and tires.

Adoption of the Specifications.

Mr. Colby offered the following resolutions:

Whereas, The report of the Chairman of the American Branch of Committee No. 1, presented at this meeting and published in Bulletin No. 25, shows that his sub-committees, in drafting the ten proposed standard specifications, carefully collected, tabulated and studied the existing American specifications for each class of material; and

Whereas, Each specification proposed as a standard by this Committee has been endorsed by letter ballot by a large majority of its thirty-four members, as representative of good American practice and as insuring the delivery of a satisfactory material; and further,

Whereas, The Chairman of the International Committee No. 1 is now issuing a circular to all national branches of Committee No. 1, asking them to adopt a standard specification for each class of material, and to send it to him prior to the Buda Pesth Congress, September, 1901; therefore, be it

Resolved, That the American Section of the International Association for Testing Materials hereby adopts as standards the ten specifications as published in the revised Bulletins Nos. 8 to 16, and No. 24, and as revised and accepted at this meeting, this adoption being subject to ratification by seventy per cent. (70 per cent.) of the votes cast by letter ballot by the members of the American Section;

Resolved, That, if thus ratified, these resolutions and these specifications be reported to the Buda Pesth Congress by the Chairman of the American Section.

These resolutions were discussed by several members and then unanimously adopted.[1]

Committee No. 1.

Dr. Moldenke offered the following resolutions:

Resolved, That the thanks of the American Section be given to the chairman and members of American Branch of Committee No. 1 for the large amount of time devoted by them to the drafting of the ten specifications since March 9, 1899.

Resolved, That the Committee be continued, and be requested to present proposed standard specifications for materials not yet covered, such as steel tubes, steel wire, steel springs, cast iron, etc.

This resolution was seconded by Prof. Merriman, and carried unanimously by a rising vote.

Report of the Executive Committee.

Prof. Merriman, on behalf of the Executive Committee, reported that the result of the vote taken at the Third Annual Meeting, by which our Chairman, Prof. Howe, was recommended to the International Council as the American Member of the Council, was duly transmitted, and that at a meeting of the International Council held in January of the present year, Prof.

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[1] On July 19th, the Secretary mailed to all members of the American Section, copies of the ten specifications as revised and adopted at the Fourth Annual Meeting, together with Bulletin No. 26, containing the above resolution, and a request for a vote on the specifications before August 10th. On account of the illness of the Secretary, he delegated Prof. Merriman and Mr. Colby to count the vote, and on August 12th they reported to the Chairman of the American Section the following recapitulation of the votes cast.

The ten specifications have therefore been adopted as American Standards.

Bulletin No.	Name of specification.	Votes cast.	Affirmative votes.	Negative votes.	Percentage in favor.
8	Structural Steel for Bridges and Ships	91	88	3	96.7
9	Structural Steel for Buildings	91	88	3	96.7
10	Open-Hearth Boiler Plate and Rivet Steel	91	88	3	96.7
11	Steel Rails	91	86	5	94.5
12	Steel Splice Bars	91	88	3	96.7
13	Steel Axles	91	86	5	94.5
14	Steel Tires	91	88	3	96.7
15	Steel Forgings	91	87	4	95.6
16	Steel Castings	91	86	5	94.5
24	Wrought Iron	91	84	7	92.3

Howe was unanimously elected as American Member of the Council.

INTERNATIONAL CONGRESS OF 1901.

Chairman Howe, on behalf of the Executive Committee, reported that all American members of the Association had been officially and cordially invited to attend the Congress to be held in Buda Pesth on September 9–16, 1901.

Prof. Merriman called attention to the draft of the proposed statutes of the International Association prepared by the International Committee No. 21, and said that in his opinion the statutes to be adopted at the Congress should permit the formation of national sections in the respective countries. Experience has shown that the technical work of the Association in this country has been much expedited by the labors of the American Section. He offered a resolution that it be the sense of the meeting that the proposed statutes should include the authorization of such national sections, the chairman of such a section to be always the Member of Council for that country.

The subject was further discussed by Messrs. Campbell, Colby, Howe, Lanza, Merriman, Moldenke, and Thackray, and finally the following resolution was adopted :

Resolved, That it is the conviction of the American Section that it should have the right to appoint and to displace its member of Council, and that this right should not be subject to review by any other body but should be absolute and final ; and that it should have the right to appoint all its own officers and conduct its own affairs without control by the Council except in so far as such control shall be obviously called for.

Resolved, That our representative be requested to obtain at the Buda Pesth Congress such legislation as can be had to this effect.

The following resolution, offered by Mr. Colby, was also unanimously adopted :

Resolved, That the Chairman of our American Section be requested to call the attention of the International Council, at the Buda Pesth Congress, to the small amount of matter printed in the English language in the Official Organ of this Association, "Baumaterialienkunde," and that it is the wish of the American Section, in view of the proportion of the expense of the publication of this Journal borne by the American members, that everything published in German or French in the Journal shall be also published in English.

Committees on Cements.

Mr. Humphrey reported that the several American committees on cements, or rather the various members representing these committees, had consolidated, and formed one committee, thus covering the entire field, as Committee No. 1 has practically done for iron and steel. They have decided for the present to consider only Problems 8, 9, 11 and 12, and in an auxiliary way, one other. This committee is practically organized now, with twelve members, having added two members, under the authority of the Executive Committee, and propose later to increase that number. The work will be divided among sub-committees and investigation will be carried on on lines similar to those of Committee No. 1.

Mr. Humphrey then offered the following resolution which was adopted after discussion by Messrs. Hagar and Webster :

Resolved, That the American Member of Council be requested to use his influence at the Buda Pesth Congress to secure the appointment of an International Committee to frame Standard Specifications and Methods for Testing Hydraulic Cements and Mortars.

Committee on Cast Iron.

Dr. Moldenke called attention to the circumstance that the American Section, at a previous annual meeting, had adopted a resolution recommending that the International Association should form a committee on cast iron. He moved that our Chairman be requested to bring the matter before the Congress of Buda Pesth, and endeavor to secure such action. The motion was adopted.

Executive Committee.

The Chairman called attention to the fact that Mr. Colby's term of office as a member of the Executive Committee expired at this meeting. On motion Mr. Colby was reelected a member of the Executive Committee for the term of two years.

Report of the Secretary.

Secretary Porter presented the following report :

The American Section of the International Association for

Testing Materials has just passed the third year of its existence, having been organized June 15, 1898. It has held three Annual Meetings: the first at Philadelphia, Pa., August 27, 1898; the second at Pittsburg, Pa., August 15 and 16, 1899; and the third at New York, N. Y., October 25–27, 1900.

At the last Annual Meeting the total membership of the American Section was 158. Since that time the Section has lost 5 members, 1 by death and 4 by resignation. There have been 15 applications for membership, making a total membership of 168 at this time.

Up to the present date the following dues have been received:

Dues for year 1899	$ 6 50	
Dues for year 1900	22 50	
Dues for year 1901	316 00	
Dues for year 1902	4 00	
Dues paid in excess	10	
Total		$349 10
Dues transferred to Treasurer:		
April 10, by check	$326 50	
June 17, by check	22 60	
Total		$349 10
Members in arrears for dues:		
For 1899, 1900 and 1901	3	
For 1900 and 1901	4	
For 1901	36	
The expenses of the Secretary's office have been as follows:		
Postage	$ 6 30	
Telephone call	20	
Total		$ 6 50

The Executive Committee has held three meetings since the last Annual Meeting; the first, October 27, 1900; the second, January 5, 1901; and the third, April 27, 1901.

REPORT OF THE TREASURER.

The Treasurer not being present his accounts were referred to the Auditors, with instructions to report the same to the Executive Committee. This Committee has since received from the Auditors the following statement submitted by the Treasurer:

Receipts.

December 31, 1900, W. Kreuzpointner	$ 21 53	
April 10, 1901, J. M. Porter	326 50	
June 18, 1901, J. M. Porter	22 60	
		$370 63

Expenditures.

April 17, 1901, Chemical Publishing Co	$ 14 66	
June 3, 1901, Chemical Publishing Co	3 00	
June 7, 1901, Chemical Publishing Co	45 00	
June 18, 1901, J. M. Porter, expenses	19 74	
July 18, 1901, Cash on hand July 18, 1901	288 23	
		$370 63

Bank book was balanced June 5, and balance shown to be	$333 37	
Deposit of June 18, above referred to amounted to	22 60	
		$355 97
Checks of June 3, 7, and 18, as above, drawn against this balance, amount to a total of		67 74
Balance now in bank, as above		$288 23

REPORT OF THE PUBLICATION COMMITTEE.

Prof. Porter, on behalf of the Publication Committee, presented the following report:

Since the last annual meeting of the American Section, October 25–27, 1900, five Bulletins, together with 14 slips containing revisions of paragraphs in Bulletins 8, 9, 10, 12, and 13, were issued; of each of these 1,000 copies were printed.

Bulletin No. 21 contains a notice of the Buda Pesth Congress, together with the minutes of Third Annual Meeting of the American Section and the minutes of two meetings of the Executive Committee.

Bulletin No. 22 contains the program of this, the Fourth Annual Meeting of the American Section.

Bulletin No. 23 contains a List of Members of the American Section, together with revised By-Laws of same.

Bulletin No. 24 contains "Revised Standard Specifications for Wrought Iron; Adopted by the American Branch of Committee No. 1."

Bulletin No. 25 contains a "Report of Committee No. 1."

The cost of these publications has been as follows:

Bulletin No. 21	$45 00	
Bulletin No. 22	3 00	
Bulletin No. 23	21 00	
Bulletin No. 24	7 50	
Bulletin No. 25	10 50	
Slips	7 50	
Pasting and cutting same	3 00	
		$ 97 50
Expense of distribution has been as follows :		
Expressage	$ 4 58	
Postage	8 36	
Twine	30	
		$ 13 24
Total,		$110 74

At this date there are at the Secretary's office 130 copies of Bulletin No. 4, 210 copies of No. 5, 330 copies of No. 6, 730 copies of No. 7, 795 copies of Nos. 8 and 9, 895 copies of No. 10, 1295 copies of Nos. 11, 12, 13 and 14, 895 copies of Nos. 15 and 16, 790 copies of No. 17, 800 copies of No. 18, 675 copies of No. 19, 665 copies of No. 20, 790 copies of No. 21, and 805 copies of Nos. 22, 23, 24 and 25.

There were also received through Prof. Howe 200 copies of "Draft of New Statutes," of which 170 were distributed among the members of this Section ; also 48 subscription blanks for the proposed Sidero-Chemical Laboratory in Zurich, of which 38 were sent to manufacturers and representatives of manufacturers of the American Section.

MISCELLANEOUS BUSINESS.

Mr. Colby called attention to a report presented at the American Railway Master Mechanics' Association last week in Saratoga, entitled "Report of Committee on the Advisability of Joining the International Association for Testing Materials." The suggestion made by the Committee was that it would be far better for the individual members of the Master Mechanics' Association to join, so as to have a larger representation and take more individual interest in the work of the Testing Association than would be the case if the Association joined as a whole. That report was adopted after a discussion which brought out very clearly the fact that every one appreciated the amout of work which this

International Association thus far has accomplished. He thought it might be of interest to know that our work had been so recently endorsed by so influential a representation of the consumers as the American Master Mechanics' Association.

Dr. Moldenke, speaking for the American Foundrymen's Association, said that he should be glad to assist in urging its members to join the International Association for Testing Materials.

INTERNATIONAL
ASSOCIATION FOR TESTING MATERIALS.

AMERICAN SECTION.

BULLETIN No. 28. MAY, 1902

FIFTH ANNUAL MEETING.

The Fifth Annual Meeting of the American Section will be held at Atlantic City, N. J., on Thursday, Friday and Saturday, June 12, 13 and 14, 1902. The headquarters will be at the Hotel Traymore, where all sessions will be held. The first session will be a business meeting following the annual address of the Chairman. The second, third, fourth and fifth sessions will be devoted respectively to the consideration of Specifications, Steel, Cement, and Cast Iron. The third, or Cement Session, which will be held on Friday evening, will be in the form of an "Engineering Smoker."

PROGRAM.

First Session, Thursday, June 12, 8 p. m.

Business Meeting.

1. Reading of the Minutes of the Fourth Annual Meeting.
2. Annual Address by the Chairman.
3. Annual Report of the Executive Committee.
4. Miscellaneous Business.
5. Election of Officers.

[A blank ballot is sent with this Bulletin to all members. This may be filled out and forwarded by mail to the Secretary or it may be voted at the meeting. The ballot will close at 9 p. m.]

SECOND SESSION, FRIDAY, JUNE 13, 10 A. M.

ON SPECIFICATIONS.

6. Report of the American Branch of Committee No 1.

7. Summary of the American and Foreign Comments on the Standard Specifications for Steel adopted by the American Section. Albert Ladd Colby.

8. Discussion of the following Modifications (shown in italics) in the Standard Specifications for Steel Rails (adopted by the American Section), embodied in the Specifications for Steel Rails adopted by the American Engineering and Maintenance of Way Association, at the Annual Meeting in Chicago, March 18, 19, 20, 1902.

(*a*) DROP TEST.—One drop test shall be made on a piece of rail not more than six feet long from *every* blow of steel. The test piece shall preferably be taken from the top of the ingot. The rail shall be placed head upwards on the supports, and the various sections shall be subjected to the following impact tests:

Weight of rail. Pounds per yard.				Height of drop. Feet.
	45	to and including	55	15
More than	55	"	65	16
"	65	"	75	17
"	75	"	85	18
"	85	"	100	19

If any rail break when subjected to the drop test, two additional tests will be made of other rails from the same blow of steel, and if either of these latter tests fail, all the rails of the blow which they represent will be rejected, but if both of these additional test pieces meet the requirements, all the rails of the blow which they represent will be accepted.

(*b*) HEAT TREATMENT.—*The number of passes and speed of train shall be so regulated that on leaving the rolls at the final pass the temperature of the rail will not exceed that which requires a shrinkage allowance at the hot saws of — inches for 85-pound and — inches for 100-pound rails, and no artificial means of cooling the rails shall be used between the finishing pass and the hot saws.*

(*c*) LENGTH OF RAILS.—The standard length of rails shall be *thirty-three* feet. Ten per cent (10 %) of the entire order will be accepted in shorter lengths, varying by even feet down to *twenty-seven* feet (27′). A variation of one-fourth of an inch (¼″) in length from that specified will be allowed.

The corresponding clauses in the Standard Specifications, adopted by the American Section, are as follows (all differences are shown in *italics*):

(*a*) DROP TEST.—One drop test shall be made on a piece of rail not more than six feet long, selected from every *fifth* blow of steel. The rail shall be placed head upwards on the supports and the various sections shall be subjected to the following impact tests:

Weight of rail. Pounds per yard.			Height of drop. Feet.
45	to and including	55	15
More than 55	"	65	16
" 65	"	75	17
" 75	"	85	18
" 85	"	100	19

If any rail break when subjected to the drop test, two additional tests will be made of other rails from the same blow of steel, and if either of these latter tests fail all the rails of the blow which they represent will be rejected, but if both of these additional test pieces meet the requirements, all the rails of the blow which they represent will be accepted. *If the rails from the tested blow shall be rejected for failure to meet the requirements of the drop test as above specified, two other rails will be subjected to the same tests, one from the blow next preceding, and one from the blow next succeeding the rejected blow. In case the first test taken from the preceding or succeeding blow shall fail, two additional tests shall be taken from the same blow of steel, the acceptance or rejection of which shall also be determined as specified above, and if the rails of the preceding or succeeding blow shall be rejected, similar tests may be taken from the previous or following blows, as the case may be, until the entire group of five blows is tested, if necessary.*

The acceptance or rejection of all the rails from any blow will depend upon the results of the tests thereof.

(*b*) HEAT TREATMENT.—*No test specified.*

(*c*) LENGTH OF RAILS.—The standard length of rails shall be *thirty* feet (30′). Ten per cent (10 %) of the entire order will be accepted in shorter lengths, varying by even feet down to *twenty-four* feet (24′). A variation of one-fourth of an inch (¼″) in length from that specified will be allowed.

9. Topical Discussion on the Question: "Is it Desirable to Specify a Single Grade of Open-Hearth Structural Steel for Bridges of Ordinary Spans?" Messrs. A. P. Boller, Theodore Cooper, J. E. Greiner, John McLeod, C. C. Schneider, J. P. Snow and others will participate in this Discussion.

10. Reports of American Branches of International Committees on all subjects other than those relating to Cement and Cement Mortars.

11. Reports of Committees of the American Section.

12. Miscellaneous Business.

THIRD SESSION, FRIDAY, JUNE 13, 3 P. M.

ON STEEL.

13. Finishing Temperature and Structure of Steel Rails. Albert Sauveur.

14. Rail Temperatures. S. S. Martin.

The discussion of the above papers will be opened by Messrs. Robert Job and P. H. Dudley.

15. The Relation Between the Basic Open-Hearth Process and the Physical Properties of Steel. C. B. Dudley.

16. The Ethics of Testing. P. Kreuzpointner.

17. Miscellaneous Business.

FOURTH SESSION, FRIDAY, JUNE 13, 8 P. M.

ON CEMENT.

"Engineering Smoker."

18. The Correlation of Cement Specifications. R. W. Lesley.

19. The Advantages of Uniformity in Methods of Testing and Specifications for Cement. G. S. Webster.

The discussion of the above papers will be opened by Mr. W. A. Aiken.

20. The Chemical Analysis of Cement: Its Possibilities and Limitations. R. K. Meade.

The discussion will be opened by Mr. Clifford Richardson.

21. Cement Testing in Municipal Laboratories. R. L. Humphrey.

22. Tests of Reinforced Concrete Beams. W. K. Hatt.

23. Reports of the American Branches of International Committees on Cement and Cement Mortars.

24. Miscellaneous Business.

FIFTH SESSION, SATURDAY, JUNE 14, 10 A. M.

ON CAST IRON.

25. Notes on the Constitution of Cast Iron. Henry M. Howe.

26. Effect of Variations in the Constituents of Cast Iron. W. G. Scott.

Papers 25 and 26 will be discussed jointly.

27. Present Status of Testing Cast Iron. R. G. Moldenke.

28. The Need of Foundry Experience for the Proper Inspection and Testing of Cast Iron.

29. A Quick Foundry Contraction Test for Metals. Thomas D. West.

Papers 27, 28 and 29 will be discussed jointly.

30. High Strength of White Iron Castings as Influenced by Heat Treatment. A. E. Outerbridge.

31. Digest of Current Specifications for Cast Iron Pipe. Walter Wood.

32. Miscellaneous Business.

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